MCWP 3-25.7

Tactical Air Operations Center Handbook

U.S. Marine Corps

PCN 143 000012 00

DEPARTMENT OF THE NAVY
Headquarters United States Marine Corps
Washington, DC 20380-1775

1 September 2001

FOREWORD

The Marine air command and control system (MACCS) provides the Marine aviation combat element (ACE) commander with the means to exercise control of those organic and nonorganic aviation assets necessary to support Marine air-ground task force (MAGTF) operations. Marine Corps Warfighting Publication (MCWP) 3-25, *Control of Aircraft and Missiles,* addresses basic planning considerations for MACCS operations, employment, and inter-
operability among MACCS and joint Service agencies.

MCWP 3-25.7, *Tactical Air Operations Center Handbook*, complements and expands on the information in MCWP 3-25 by focusing on the details of the tactical air operations center (TAOC) operations and the role the TAOC plays in integrated MAGTF, joint, and multinational operations. Designated for MAGTF, naval expeditionary force, and joint force commanders and staffs, MCWP 3-25.7 highlights TAOC—

Organization
Equipment
Planning considerations
Operational fundamentals
Employment options

By investigating these areas, MCWP 3-25.7 provides the requisite information needed by commanders and staffs to understand and evaluate the operational principles and capabilities of various TAOC employment options.

Recommendations for improving this publication are invited from commands as well as directly from individuals. Forward suggestions using the User Suggestion Form format to—

Commanding General
Doctrine Division (C42)
Marine Corps Combat Development Command
3300 Russell Road Suite 318A
Quantico, Virginia 22134-5021

Reviewed and approved this date.

BY DIRECTION OF THE COMMANDANT OF THE MARINE CORPS

EDWARD HANLON, JR.
Lieutenant General, U.S. Marine Corps
Commanding General
Marine Corps Combat Development Command

DISTRIBUTION: 143 000012 00

Chapter 1

Fundamentals

The tactical air operations center (TAOC) is the Marine air command and control system's (MACCS's) principal air defense agency that conducts airspace control and management. Personnel and equipment are provided by the Marine air control group's (MACG's) Marine air control squadron (MACS).

Through radar inputs from its organic sensors and data link information from other military radar units (MRU), the TAOC provides real-time surveillance of assigned airspace in addition to air direction, positive aircraft control, and navigational assistance to friendly aircraft. Its primary function, to conduct and coordinate anti-air warfare (AAW), is accomplished through the direction, coordination, and employment of various air defense weapons systems which include interceptor aircraft and ground-based air defense (GBAD) weapons.

FUNCTION

The TAOC provides air surveillance and control of aircraft and surface-to-air weapons (SAWs) for AAW in support of the Marine air-ground task force (MAGTF).1

Role

The TAOC—

Provides airspace control, management, and surveillance for its designated sector or area of interest (AOI).

Provides navigational assistance, including itinerant air traffic control, to friendly aircraft.

Detects, identifies, and controls the intercept of hostile aircraft and missiles.

Deploys early warning and control (EW/C) sites to supplement or enhance the TAOC's radar coverage.

Assumes agency coordination functions of the alternate tactical air command center (Alt TACC) or alternate tactical air direction center (Alt TADC) for limited or specified periods when required or directed.

TASKS

The TAOC—

Recommends employment of assigned weapons and surveillance means.

Recommends air defense sectors, subsectors, and weapon engagement zones (WEZ) for itself and component elements.

Deploys sensors and communications systems to provide air surveillance.

Detects, identifies, and classifies all aircraft and missiles within

its assigned sector.

Displays and disseminates appropriate air/ground information to designated adjacent, higher, and subordinate agencies (such as the Marine tactical air command center [TACC], another TAOC, the direct air support center (DASC), and Marine air traffic control detachments (MATCDs), Ground Based Air Defense (GBAD) units, and aircraft.

Selects and assigns appropriate weapons to engage and destroy the enemy air threat.

Controls fires of subordinate air defense elements.

Functions as an Alt TACC/Alt TADC when directed for limited or designated periods of time.

Interfaces with adjacent and higher air defense agencies.

Manages air defense resources.

Coordinates and executes emission control (EMCON) conditions in its assigned sector.

Conducts itinerant air traffic control and provides navigational assistance to friendly aircraft.

TAOC ORGANIZATION

The TAOC crew is the heart of its air defense operations. TAOC crews are task-organized to meet specific mission requirements. A notional TAOC crew is functionally divided into four sections: command, surveillance, traffic, and weapons (see fig. 1-1).

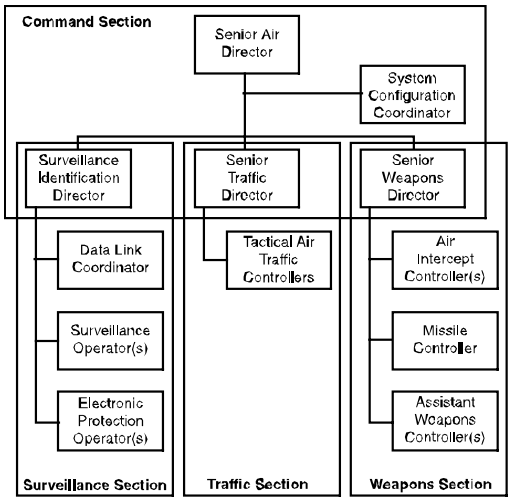


Figure 1-1. Notional TAOC Crew Organization.

Command Section

The command section supervises the functioning of the surveillance, traffic, and weapons sections. The command section includes the senior air director (SAD), surveillance identification director (SID), senior traffic director (STD), senior weapons director (SWD), and the system configuration coordinator (SCC).

Senior Air Director. The SAD is responsible for the TAOC's detailed operations. The SAD ensures that proper coordination occurs among the various TAOC sections, directs ongoing maintenance through the SCC, and assigns casualty roles to crew members.

Surveillance Identification Director. The SID is responsible to the SAD for the detection, identification, and classification of all radar inputs within the TAOC's assigned sector and for coordinating electronic protection (EP) within the sector. The SID also supervises the exchange and correlation of aircraft position and identification information with other control agencies and coordinates all TAOC data link operations.

Senior Traffic Director. The STD is responsible to the SAD for the coordination and routing of all air operations in the TAOC's assigned sector. The STD assumes responsibility for the control of aircraft not engaged in air defense and conducts aircraft handovers with other agencies as required.

Senior Weapons Director. The SWD is responsible to the SAD for the proper employment of air defense weapons. The SWD evaluates the threat and, in accordance with the aviation combat element (ACE) commander's AAW plan and rules of engagement (ROE), assigns weapons to negate the threat. As the SWD directly supervises engagements, the SWD effects the coordination of threat engagements between and across multiple weapons engagement zones (WEZs) (i.e., assignments, disengagements, reengagements).

System Configuration Coordinator. The SCC is responsible to the SAD for equipment readiness and ongoing maintenance efforts. When required, the SCC conducts manual reconfiguration

of computer and communications equipment to optimize TAOC operations or in response to equipment failures.

Surveillance Section

The surveillance section detects, identifies, and classifies all targets within the TAOC's assigned sector. Headed by the SID, this section correlates air tracks reported from all sources and also manages the air picture developed within the TAOC and transmitted via data links or voice cross tell nets. The section employs EP and supervises the EMCON conditions set by the TACC. The section consists of the data link coordinator (DLC), surveillance operators (SOs).

Data Link Coordinator. The DLC is responsible to the SID for the TAOC's data link configuration. The DLC manages data link configuration by initiating directed changes to degraded links with subordinate agencies and recommending changes to degraded links to adjacent and senior agencies.

Surveillance Operator. The SO, under the direction of the SID, monitors radar inputs, initiates or monitors the acquisition of air tracks, performs preliminary identification, and updates track data as required.

Traffic Section

The STD supervises the traffic section. The traffic section provides airspace management for enroute, itinerant, and orbiting aircraft such as airborne warning and control system (AWACS) aircraft; airborne command posts; transiting or orbiting close air support (CAS)/deep air support (DAS); and aerial refueling (AR) missions. The section also consists of one or more tactical air

traffic controllers (TATCs). The TATC is responsible to the STD for detailed airspace management within the TAOC's assigned sector for all missions not controlled by the weapons section. Cognizance begins when aircraft enter the TATC's assigned area or are handed over to the TAOC by another agency and continues until the aircraft exit the assigned area or are handed off to another enroute or terminal control agency. In addition to providing navigational assistance, the TATC transmits friendly and threat situational awareness information to aircraft entering or transiting through the assigned sector. The TATC also initiates tactical digital information link (TADIL) C data links with all appropriately equipped aircraft and maintains track symbology on all aircraft under TATC control.

Weapons Section

The weapons section, under the supervision of the SWD, makes weapons assignments in accordance with the ROE and the AAW plan. The section provides for control of all aircraft on AAW missions and the management of surface-to-air weapons (SAWs) in the TAOC's assigned sector. In addition to the SWD, one or more air intercept controllers (AICs), a missile controller (MC), and one or more assistant weapons controllers (AWCs) form the weapons section.

Air Intercept Controller. The AIC is responsible for the control of AAW missions from the point the aircraft is handed off from the traffic section until that mission is returned to the traffic section. The AIC is responsible for the successful intercept of hostile airborne targets assigned by the SWD. The AIC controls combat air patrol (CAP) aircraft and augments surveillance efforts in his assigned zone with CAP aircraft radar.

Missile Controller. The MC controls applicable SAW engagements within the TAOC's sector. The MC usually coordinates and operates Army tactical data link 1 (ATDL-1) data links with surface-to-air missile (SAM) assets.

Assistant Weapons Controller. The AWC provides assistance to the AIC and/or MC, including entering data on aircraft tracks, monitoring tracks, monitoring radio nets, and maintaining aircraft missile control logs. The AWC operates TADIL-C data links with appropriately equipped aircraft as directed by the AIC. During the conduct of hostile target intercepts, the AWC provides the AIC/MC information about the heading, altitude, and speed of the hostile target.

EW/C Crew Configuration

The EW/C crew is task-organized as directed by the TAOC. The EW/C crew will normally be capable of limited air surveillance and weapons control.

CREW BRIEFINGS

TAOC crew briefs are adapted to mission requirements and are normally conducted before crew members assume duty. Appendix A outlines the minimum contents of a brief as required by Marine Corps Order (MCO) 3501.9B, *Marine Corps Combat Readiness Evaluation System (MCCRES)*.

Chapter 2

System Description

The TAOC consists of operator shelters, air surveillance radars, communications equipment, and mobile electric power (MEP) (i.e., generator) equipment. This equipment allows air defense control officers, tactical air defense controllers, and air control electronics operators to maintain air situational awareness and to effectively control, coordinate, and manage air defense employment within the TAOC's assigned sector.

TACTICAL AIR OPERATIONS MODULES

The hub of the TAOC is the AN/TYQ-23V4 tactical air operations module (TAOM) (fig. 2-1). Each TAOC has four TAOMs. *A subset of the TAOC is the early warning and control (EW/C) site and it will have one or two TAOMs.* The TAOM is a transportable, modularized, automated command and control shelter designed to conduct AAW control, tactical air traffic control, surveillance and identification functions for the MAGTF. The TAOC's modular concept allows TAOMs to operate in stand-alone configuration or to be combined with other TAOMs to increase system capability and redundancy. Each TAOM contains the mission-essential equipment (i.e., computers, operator positions, and digital and voice communications) required to provide limited command and control (C^2) functions. TAOMs can be dispersed up to 500 meters apart from one another and functionally connected over fiber-optic cables. Fiber-optic cables allow dispersing TAOC radars up to two kilometers from a TAOM. Radars can also be remoted up to 40 kilometers from the TAOC and interfaced to the *TAOM* over remote radar data links.

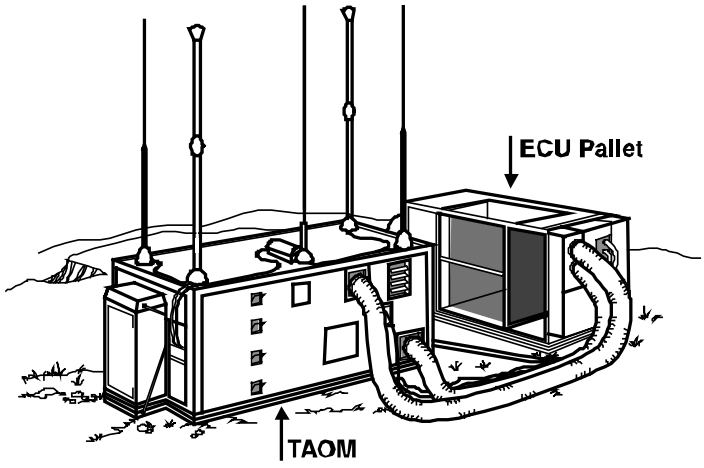


Figure 2-1. TAOM with ECU Pallet.

The TAOC's modularity concept allows the build-up or scale-down of system capacity without disrupting C^2 air command and control operations. It also allows echeloning C^2 air defense command and control as the battle progresses. TAOM shelter and environmental control unit (ECU) pallet data are shown in tables 2-1 and 2-2.

Transportability

The TAOM's transportability permits deployment of an air control capability that can manage a wide variety of air situations. The TAOM may be transported by commercial or military air, land, or sea vehicles or it may be towed using a M-1022 mobilizer. The TAOM travels with most of its equipment

Table 2-1. TAOM Shelter Specifications

Length	20 feet
Width	8 feet
Height	8 feet
Square	160 square feet
Cube	1,280 cubic feet

Table 2-2. ECU Pallet Specifications.

Weight	16,500 pounds (approximately)
Power requirements	120/208 volts, 60 hertz, 23 kilowatts, 3 phase, 4 wire

Length	12 feet
Width	7 feet
Height	8 feet
Square	86 square feet
Cube	688 cubic feet
Weight	6,500 pounds (approximately)
Power requirements	120/208 volts, 60 hertz, 30 kilowatts, 3 phase, 4 wire

packaged inside the shelter (module), including antennae and some power cables.

The ECU pallet houses the remainder of the equipment including the B0007 heating and air conditioning units; chemical, biological and radiological [CBR] protection equipment; and the fiber optic and power cables.

Versions

The AN/TYQ-23 is operated in two versions: The US Marine Corps operates Version (4) called the TAOM. The US Air Force operates Version (3) or P3I (pre-planned product improvement) called modular control equipment [MCE]. Actually, the term "TAOM" applies to either version of the AN/TYQ-23, as dictated by common usage. A shortened acronym, "OM," is also commonly used to refer to a module or shelter in either service. The two versions respond to the different tactical requirements of the US Marine Corps and US Air Force. These different requirements are satisfied with TAOM hardware, which, for the most part, is the same for both Services. US Air Force software is the baseline version and mostly common to both systems. ***Deadlining criteria is covered in appendix E.***

Differences

The major differences between the two versions of the TAOM are the display symbols on the operator console units (OCUs) and the method by which the radar data is processed. The US Marine Corps version employs an upgraded TAOM interface group (TIG) at each radar site. The addition of Modern Tracking System (MTS) software and a high-speed processor into the TIU now enable radar track processing to be performed at the TIU (local) prior to transmission to the TAOM. The TAOM combines radar

data from all local (organic) radars into tracks. Radar video and sweep data are still forwarded via 2km fiber optic and shared over the existing radar data bus; however, the processed track package is delivered via a 2km Fiber-Channel cable that terminates at the Radio/LAN Demarcation Panel where it is routed by the Fiber-Channel switch (FCS) to the active radar tracker software segment. The US Air Force version employs a MCE interface group (MIG) located at the radar site. The MIG preprocesses the radar data and generates tracks. The tracks are then sent to the TAOM, where they are combined into system tracks.

Improvements

Theater Missile Defense

Various modifications have been made to TAOC equipment to upgrade its theater missile defense (TMD) capabilities. Concentrating on the theater missile (TM) threats most likely to influence a MAGTF (i.e., shorter-range theater ballistic missiles [TBMs] and cruise missiles [CMs]), TAOC modifications ~~will~~ are primarily focused on the TAOM and the AN/TPS-59(V)3.

TAOM Modifications. The TAOM has been modified to receive, process, and distribute, and/or forward TBM target data to AAW and GBAD units capable of engaging and destroying the target and other C^2 agencies via digital data communications.

The TAOM (V)4 processes TADIL-J information, operates in TADIL-J voice, and additionally has a laser printer, Fibre Channel switch, LAN ports, two AN/VRC-89D SINCGARS VHF radios, and firmware reconfigurable modems in the DCU. The OCUs have been upgraded to 26” monitors, keyboard and trackball. The operator display is Windows NT.

Delivery

The fleet Marine force (FMF) began receiving the TAOM (V)4 in FY 2001.

Functions

The TAOM provides a full range of air command, control, and communications (C^3) capabilities necessary to conduct air defense including—

Air surveillance.

Weapons control.

Tactical air traffic control.

Electronic warfare (EW).

Communications.

Simulation and training.

Monitoring and testing.

Operator Interface

Each TAOM contains four OCUs. Each OCU is the primary operator-to-TAOM interface. The OCU provides the operator with the means to display radar surveillance data from up to four sensors; activate and perform digital data link operations with surface, shipborne, and airborne data link platforms; conduct

AAW control of interceptor aircraft and GBAD units by either voice or data communication; and conduct tactical air traffic control for friendly aircraft.

Voice Communications

Each TAOM contains internal radio equipment (IRE) to support voice and data communications. In addition to its internally housed ultra high frequency (UHF), very high frequency (VHF), and high frequency (HF) radios, the TAOM has the capability to introduce externally controlled radios and point-to-point circuitry from outside the TAOC to augment the TAOC's communication requirements. Each TAOM also internally houses the required cryptographic instruments needed to encrypt its radios. Additionally, each TAOM contains secure voice telephone capability and has the capability to introduce both two-wire analog and four- wire digital telephonic communications devices. The TAOC's voice capabilities depend on the number of TAOMs deployed and the external communications support available. Table 2-3 lists specific TAOM voice communications capabilities.

Data Communications

The TAOC can exchange surveillance data with data link-equipped agencies such as the US Air Force's control and reporting centers (CRC); US Army Patriot systems; US Navy airborne tactical data systems (ATDS) and naval tactical data systems (NTDS) units; AWACS aircraft; GBAD units; and appropriately equipped interceptor aircraft over TADILs. The TAOC can also interface with North Atlantic Treaty Organization (NATO) ground-based agencies over the NATO air defense ground environment (NADGE) data link, known

as NATO Link 1. Interface modes and capabilities are—

Item	Quantity
KY-58 (external)	14
ANDVT.KY-75 with RCU	4 (internal/external)
HYX/HYP-57	12
KG-84A,	13
KG/KGX-40	1
AN/VRC-89D (VHF)	2
External Radios*	10
AN/GRC-171V4 (UHF)	4
Harris HF Radio	2/1**
Ky-68 Secure Telephone	1
Telephone	4
Direct Access Trunks	4

* Refers to the number of external radios which may be added to the 3 VHF, 4 UHF, and 2 HF radios internal to each TAOM.

** One HF radio can be removed and replaced with a third computer during single OM EW/C ops. Five computers provide maximum system capability.

Table 2-3. TAOM Voice Communications Capabilities.

TADIL-A (Link 11) is a netted, half-duplex (poll-response), digital data link normally used for connectivity between ATDS and NTDS platforms. TADIL-A requires a net control station (NCS) which is a machine function designed to synchronize the track reporting of TADIL-A participating units (PUs). TADIL-A data is encrypted through a KG-40A encryption device. The carrier for TADIL-A data is HF and/or UHF communication media.

TADIL-B (Link 11B) is a point-to-point, full duplex data link conducted between two reporting units (RUs) which include appropriately equipped MRUs and GBAD systems. TADIL-B data is simultaneously received and transmitted between RUs. TADIL-B operations are normally conducted over multi-channel radio (MUX), satellite communication, telephone lines, or cables and are generally limited to providing connectivity between ground-based units. TADIL-B is encrypted by a KG-84A/C encryption device.

TADIL-C (Link-4A) is a data link conducted between the TAOC, F-14 and F/A-18 aircraft. TADIL-C data links can be configured for one-way, limited two-way, and full two-way. TADIL-C data links are conducted over UHF radio and are unencrypted.

TADIL-J (Link-16) is the DoD primary tactical data link for all Service and Defense Agency Command and Control (C2), Intelligence (I), and, where practical, weapon system applications. It is a secure, jam-resistant, digital signal, nodeless data link which uses the joint tactical information distribution system (JTIDS) Class 2 and MIDS TDMA terminals over UHF radio and a **KGV8** encryption device, and the J-Series Message Standard, defined by MIL-STD 6016.

ATDL-1 data links are point-to-point, digital data links established between the TAOC and firing units. ATDL-1 links operate and are encrypted in the same manner as TADIL-B links.

NATO Link 1 is a point-to-point, data link which functions similarly to TADIL-B links except that Link 1 is not encrypted, and does not transmit digital orders.

The TAOC can conduct a point-to-point Theater Force Management System (TFMS) data link. TFMS links options are multi-speed variant (MSV)1, AUTODIN I, and AUTODIN VI. A given TAOC can only run one of these options at a time. Selectable by Firmware Reconfigurable Modem (FRM) when building data link data base.

The TAOC's data link capabilities are determined by the number of TAOMs operating as part of the TAOC. See table 2-4.

Table 2-4. TAOC Data Link Capabilities.

# TAOMs	1	2	3	4
* Point to Point Data Links	9	11	13	13
TADIL-A	1	1	1	1
TADIL-C	1 (1 WAY-60 A/C, 2 WAY-12A/C)	1 (1 WAY-60 A/C, 2 WAY-12A/C)	1 (1 WAY-60 A/C, 2 WAY-12A/C)	1 (1 WAY-60 A/C, 2 WAY-12A/C)
TADIL-J	1	1	1	1

* Point-to-point data links include TADIL-B, ATDL-1, and NATO Link 1 links

Table 2-4. TAOC Data Link Capabilities

Automated Functioning

The TAOM provides certain automated functioning capabilities which significantly enhance the operator's ability to conduct surveillance, traffic, and weapons functioning. Two of the primary automated functions include aircraft identification and weapons control modes.

Automated Aircraft Identification Modes. Identification of friendly aircraft can be assisted through automatic identification, friend or foe (IFF) correlations. Operators enter friendly Mode I, II, and/or III information into the TAOC data base. The data base will make a correlation between the ATO-entered information and the squawks reported by aircraft. If a correlation is made between the Mode I/III tables and/or the Mode II ATO data, the air track will be classified as designated in the ATO file.

Mode IV responses are also used in the identification process through automatically performed Mode IV tests. When the TAOC is operating in the low threat mode, Mode IV interrogations are not performed automatically. In the medium threat mode, a track's recommended identity (based on automatic identification) is compared to its current identity. If a high or low confidence Mode IV response is received after a manual Mode IV interrogation and the track's identity is unknown, assumed friend, or assumed enemy, the track's identification will automatically be changed to unknown/assumed friend. When operating in the high threat mode, automatic Mode IV interrogation is performed on all tracks with an identification of unknown/assumed friend. A track with an identity of unknown is automatically updated to a friend when a high confidence Mode IV response is received or unknown/assumed friend when a low confidence response is received.

Additional automated identification capabilities are available through execution of a series of parameters entered into the TAOC's data base. The identification/classification subprogram will track recommend classification based on the results of up to 10 different tests including aircraft profile, IFF, and proximity to designated vital area(s).

Automated Weapons Control Modes. The TAOC's automated weapons control modes can provide significant assistance to the TAOC crew regarding threat ranking and intercept feasibility. The TAOC has three weapons control modes: manual, semiautomatic, and automatic.

In the manual mode, the TAOC will not conduct automatic weapons trials or engagements. Trial and weapons assignments are conducted by the operator.

In the semiautomatic mode, the system acts in an advisory capacity. Tracks are threat-ranked based on their proximity to vital areas, speed/heading, and their assigned identity. All available weapons systems are trialed against hostile or faker tracks, beginning with the highest-ranked threat. The system will display the three shortest time-to-intercept (TTI) solutions based on available GBAD, airborne interceptor, or alert interceptor availability. The operator may then choose to accept or reject the recommended action. In the semiautomatic mode, the TAOC will continue to try all hostile and faker tracks until they are engaged or until no other weapons are available to intercept the threat.

The automatic mode functions similarly to the semiautomatic mode except that when the TTIs are compared, the system will automatically assign the weapon with the shortest TTI to engage the target. Multiple weapons will be assigned to raid-sized groups.

Two weapons will be engaged against raid sizes of few; four weapons will be assigned against raid sizes of many. When the raid size is designated as few or many, GBAD assets may be the preferred weapon based on TTI and hot missile inventories. Dissimilar weapons will not be simultaneously engaged against the same target, thus reducing the chance of fratricide.

Countermeasures

The TAOC has several automatic capabilities designed to enhance its survivability against electronic and direct attack. These capabilities include automatic activation of an EMCON plan and identification and threat ranking of antiradiation missiles (ARMs). The EMCON capabilities allow the TAOC operator to enter protective measures into the TAOC data base should an ARM threat be detected. When a track is identified as a probable ARM threat, the TAOC will automatically initiate the predetermined EP measures plan entered into the data base. This EP plan may include radar blinking and blanking and activation of ARM decoys. The system's data base also provides operators with the opportunity to designate operational parameters to assist in identifying possible ARMs. These tests are based on speed and time-to-go thresholds and the missile's heading angle (the angle between the missile's heading and a line from the missile's heading to a TAOC radar). Tracks meeting the designated criteria are classified as ARMs.

JTIDS Module (JM)

Each MACS has one Joint Tactical Information Distribution System (JTIDS) module (JM) to exchange information with joint service air C^2 agencies through operation on the TADIL-J digital data network. The JM (radio terminal set AN/TSC-131) is a

standard integrated command post shelter which contains a JTIDS 2H (class 2) terminal, multiplexer, and associated equipment (including antennas and cryptographic equipment) required to remote the JM. The JM is a mobile and rapidly deployable system that can be collocated with the TAOC or operated in a stand-alone mode to rebroadcast received messages to other JTIDS-capable command, control, communications, computers, and intelligence (C^4I) platforms. **Deadlining criteria is covered in appendix E.**

Air Defense Communications Platform

The AN/MSQ-124 Air Defense Communications Platform (ADCP) provides a single shelter for receiving and transmitting tactical data within the Marine Air Command and Control System (MACCS). The ADCP has a JTIDS terminal and interfaces with a TADIL–J Network. The TADIL-J equipped ADCP receives tactical data and transmits this data to short-range Air Defense (SHORAD) units via the Ground Based Data Link (GBDL). The ADCP also provides immediate translation of TBM data from the AN/TPS-59(V)3 radar via a point to point data link (PPDL). The ADCP consist of radio and computer equipment housed in a Lightweight Multi-purpose Shelter (LMS) mounted on a M1097 High Mobility Multi-Purpose Wheeled Vehicle (HMMWV). **Deadlining criteria is covered in appendix E.**

RADARS

The TAOC's organic radars provide the air picture necessary to efficiently control and manage air defense within its assigned sector. The TAOC can accept data from four radars and process data from as many as three radars at a time. However, each TAOC has a mix of two AN/TPS-59(V)3 and AN/TPS-63B *radars*.

AN/TPS-59 Radar Set

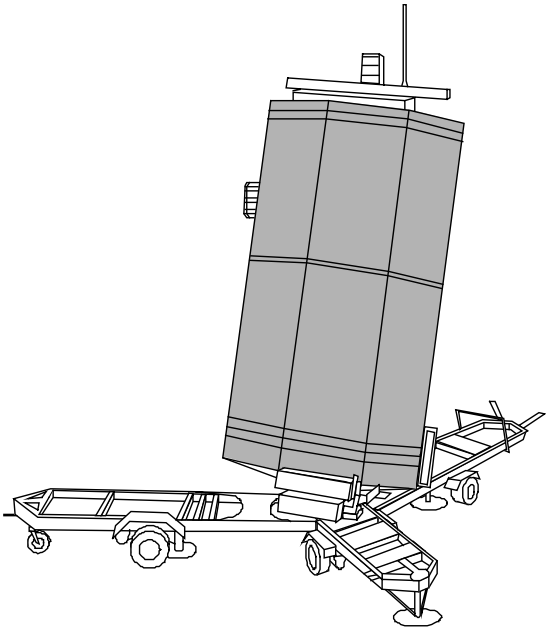


Figure 2-2. AN/TPS-59(V)3 Radar.

The AN/TPS-59(V)3 (fig. 2-2) is a solid state radar designed to provide long-range air surveillance. The AN/TPS-59(V)3 is a three-dimensional (bearing, range, and target altitude), linear-phased array radar which operates in the D band (1215-1400 megahertz [MHz]). The radar set consists of two shelters and an antenna which is transported on three single-axle trailers. Specifications are shown in table 2-5. The radar control shelter has

~~one~~ two position display console which are capable of providing a planned position indicator (PPI) display, range height indicator (RHI) display, or both displays simultaneously. The radar's 54 transmitters are arranged in 54 rows and operated independently of each other. It is recommended that the radar should be deadlined if it is unable to detect or track (1) Air Breathing Targets (ABT) or (2) Theater Ballistic Missiles (TBM). **A more detailed explanation of deadlining criteria is covered in appendix E.** The AN/TPS-59(V)3 also has the capability of operating in the two-dimensional mode should its general purpose computer fail. The AN/TPS-59(V)3 radar suite includes four ARM decoy pallets. Theater missile defense (TMD) enhancements to the AN/TPS-59(V)3 radar improve its range and altitude detection capabilities to 400 nautical miles and 500,000 feet respectively against ballistic missile targets.

AN/TPS-59(V)3 Radar. The radar has been modified to provide increased ability to detect, track, and process TBM targets and distribute those targets to the ADCP and TAOM.
The AN/TPS-59(V)3 is connected to a TAOM via two fiber optic cable for passing air breathing target (ABT) information and to the air defense communications platform (ADCP) via a point-to-point data link for passing TBM tracks. When the AN/TPS-59(V)3 is connected to the ADCP, three TBM messages are passed via TADIL-J:

The ballistic missile message: Contains vector and other descriptive data and covariance data.

The reference point message: Contains launch point and impact point data.

The data update request message: Contains multiple missile update capability and data selection capability.

Table 2-5. AN/TPS-59(V)3 Radar Specifications.

	Length (in feet)	Width (in feet)	Height (in feet)	Square Feet	Cubic Feet	Weight in pounds (approx)
(2) Radar Control Shelter, ea.	12	8	8	89	629	6000
(2) Antena Trailer "A", ea.	22.5	8	8	180	1395	9000
(1) Antena Trailer "B"	18	8	7	147	978	9000
System Power Requirements: 120 volts, 400Hertz, 50 kilowatts, 3 phase						

AN/TPS-63B Radar Set

The AN/TPS-63B radar (fig. 2-3) is a transportable, lightweight radar designed to provide short to medium range, two-dimensional (bearing and range) air surveillance information to the TAOC.

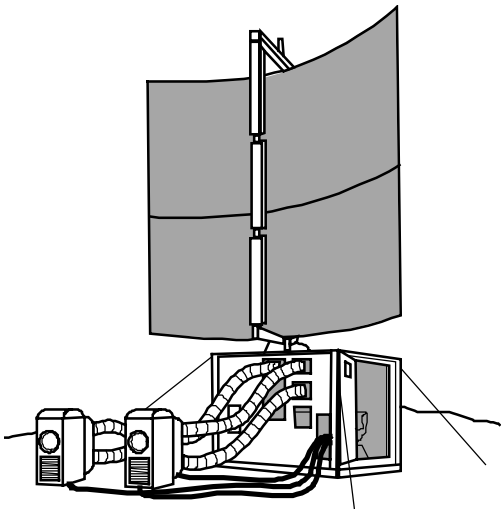


Figure 2-3. AN/TPS-63B Radar.

The AN/TPS-63B radar is also a D band emitter (1250-1350 MHz) and has a selectable search range of 80, 120, or 160 nautical miles up to 40,000 feet in altitude. Because of its single shelter design, the AN/TPS-63B is considered the TAOC's primary assault radar. The radar contains a single display console and can be employed in a stand-alone mode to provide early warning information. The radar should be considered deadlined if it is unable to perform its basic mission of detecting and tracking ABTs. **A more detailed explanation of deadlining criteria is covered in appendix E.**

Table 2-6. AN/TPS-63 Shelter Specifications.

Length	10 feet
Width	8 feet
Height	8 feet

Square	80 sqft
Cube	640 cuft
Weight	7800 pounds (approx
Power requirements	120/208 volts, 60 hertz, 30 kilowatts, 3 phase

COMMUNICATIONS

The MACS table of equipment (T/E) provides UHF, VHF, and HF communications capabilities in addition to those located internally to the TAOM. The TAOC is also supported through the MACS's wire, telephonic, and switchboard assets.

MOBILE ELECTRIC POWER

The MACS provides its own 60 and 400 Hz mobile electric power (MEP) to support TAOC operations.

TAOC CAPABILITIES

System Redundancy

The TAOC has the capability to automatically reconfigure its system operations should one of the TAOMs become inoperative. This redundancy is accomplished through designation of primary and secondary main computer systems, redundant data and voice control buses, and passive electro-optical relays located at the radar ports.

Echelon Capability

The TAOC can move to alternate locations with uninterrupted

operations. During such movements, the TAOC usually delegates increased responsibilities to its EW/C site to maintain agency connectivity and continue to provide medium-range surveillance and limited control of aircraft and missiles.

TAOC LIMITATIONS

Electronic Signature

The TAOC has a large electronic signature generated by its air surveillance radars and voice and data communication equipment. Effective planning and employment of EMCON measures are paramount to maximizing survivability.

Low Altitude Air Surveillance

Because the TAOC employs ground-based radar systems, its radar coverage is susceptible to line of site (LOS) limitations. This occurs from curvature of the earth and terrain features within the radar's search range and can preclude effective low-altitude coverage. Use of high ground for radar emplacement, airborne sensors, dispersion of sensors, incorporation of other radar units' air picture, and visual observation can be used
to minimize terrain masking affects on the TAOC.

Transportability

The MACS T/E provides for organic motor transport capability required to employ the TAOC but the assets are limited. Materials handling equipment (MHE) is required for

emplacement unless the shelters remain mobile loaded. TAOMs may be mobile loaded on a M4818 LVS with the addition of corner mods. MARCORSYSCOM is conducting the testing necessary to determine the maximum height and maximum weight at a maximum speed at which a TAOM may be secured to a M4818 LVS using the corner mods. The corner mods bolt into existing holes on the corners of the TAOM.

M-1022A1 Mobilizer

To alleviate mobility problems associated with the TAOC, actions are underway to procure the M-1022A1 mobilizer for the MACS. The M-1022A1 consists of a pair of dollies which are bolted to the ends of the TAOM shelter, thus allowing the TAOM to be towed behind a 5-ton truck. Designed to operate on improved surfaces (i.e., paved or gravel roads), the mobilizer incorporates a hydraulic lift system capable of lifting the TAOM 10-18 inches off the deck. The mobilizer can also be used to facilitate TAOM

loading/offloading from aircraft and shipping. Each MACS is

scheduled to receive five M-1022A1 mobilizers.

THEATER BATTLE MANAGEMENT CORE SYSTEMS

Theater Battle Management Core Systems (TBMCS) is an Air Force developed system architecture designed to provide the automated tools necessary to manage tactical air operations, execute area air defense and airspace management in the tactical area of operation, and to coordinate operations with components of other military services. Specifically, the TBMCS software provides the automated capability to generate, disseminate and execute the Air Tasking Order

(ATO). The TAOC's terminal will be located in the Sector Air Defense Facility (SADF).

TAOC SYSTEM UPGRADES

Cooperative Engagement Capability

The TAOC's TPS-59(V3) radar will be upgraded to incorporate the Navy Cooperative Engagement Capability (CEC). The CEC system is designed to fuse data from multiple sensors to provide near-continual tracking and fire quality control data to air C^2 and GBAD units. This capability will significantly enhance both Navy and Marine capabilities to track both ABT and TBM targets and engage these targets at maximum range.

MODIFIED ADCP (MADCP)

The MADCP will have a fiber optic data and voice link to the TAOM. It is designed to provide the MACSs with a multi-functional JTIDS platform capable of performing four mutually exclusive missions. These missions are: (1) Provide TBM target data for TBMD from the AN/TPS-59(V)3 radar via PPDL and/or TADIL-J, and transmit that data to a TADIL-J Network, (2) Provide early warning capability of ABTs to SHORAD units via GBDL, (3) JTIDS relay, and (4) JTIDS capability with the integrated TAOM (V)4.

Marine Corps Airborne Early Warning System

The Marine Corps Airborne Early Warning System (MCAEW) system will provide the TAOC with enhanced low-altitude air surveillance. MCAEW is envisioned to be a light-weight radar employed on an aviation platform (unmanned aerial vehicle [UAV], helicopter, fixed-wing aircraft) which will transmit the radar picture back to the TAOC over a UHF/VHF remote radar link.

Gap-Filler Radar

A replacement for the TAOC's AN/TPS-63 radar is planned to be the Multi-Role Radar System (MRRS). The new gap-filler radar is envisioned to be medium range, three-dimensional, mobile, and provide connectivity to the TAOC over a UHF/VHF remote radar link.

Common Aviation Command and Control System

Upon the end of its service life (2005+), the TAOM will be replaced by the Common Aviation Command and Control System (CAC^2S) and its associated communications suite. This system, which will be fielded to all major MACCS C^2 agencies and designed to fit each of their missions, will provide the TAOC with a standardized hardware suite which includes a server, workstations, TADIL processors, radar processors, communications equipment, etc., required for the TAOC mission. The CAC^2S's software will consist of standardized common components (to ease maintenance and logistics efforts) along with TAOC-specific applications.

Chapter 3

Planning

Planning responsibilities for providing air defense within the MAGTF Area of Operations (AO) and for the TAOC's employment are generally divided between the Tactical Air Command Center, Sector Air Defense Facility staff and TAOC crew members. However, because these functions closely parallel one another, efforts are usually combined. MCO 3501.9B, *MCCRES*, outlines specific planning requirements for these two agencies. Although the planning phases outlined below may occur in sequence, most steps will be conducted con- currently.

INITIAL PLANNING

After receipt of an initiating directive from the MAGTF commander (in situations involving amphibious operations) or after receiving an operation plan's (OPLAN's) initiating order, the TACC, SADC and TAOC staff will begin the initial planning phase. Considerations for the initial planning phase include—

Establishing early liaison and initiating coordination efforts with amphibious task force (ATF) and joint force planners and coordinating with adjacent and subordinate units for operational execution.

Identifying communications requirements to subordinate, adjacent, and higher level circuits with the ACE/MAGTF communications planners. These

requirements should include identification of desired connectivity, encryption hardware and software, and authentication materials.

Coordinating all frequency requirements (voice, data, radars) for subordinate, adjacent, and higher level circuits with the ACE/MAGTF communications planner.

Providing input to the initial estimate of landing force aviation requirements. This initial estimate should include the number and type of aircraft available, the control agencies necessary, and the logistic support required. Some of the air defense allocations can be deduced from the aviation capabilities of the force involved, estimates of enemy air threat, and the general mission of the landing force (LF).

Providing air defense missile and aircraft control specialist input to the aviation estimates of supportability for all assigned operations. This input should summarize significant aviation aspects of the situation as they might influence any course of action (COA) proposals and should evaluate and determine how aviation units can best be employed to support the contemplated LF COAs. The estimate is prepared by the ACE commander assisted by his staff and subordinate elements. The end product of the aviation estimates of supportability will include recommending a COA to the ACE commander. At a minimum, the aviation estimates of supportability will include—

The contemplated COA(s) that can best be supported by the ACE.

Disadvantages of less desirable COAs.

Significant aviation (to include C^3) limitations and problems of an

operational or logistic nature.

INTELLIGENCE PLANNING

TAOC and SADC intelligence planning focuses on ascertaining enemy orders of battle (EOB) and capabilities. Intelligence planning considerations will include—

Obtaining preliminary aviation intelligence estimates and detailed aviation intelligence estimates.

Developing essential elements of information (EEIs) in the form of simple, concise requests. EEIs should be forwarded in three parts: positive requests, qualifying questions and statements, and prioritization of submitted requests.

Determining the TAOC and SADC staffs' requirements for maps, charts, photographs, and other graphic aids.

Obtaining a complete EOB which includes information regarding the threat's missiles, aviation assets, EW, naval, and ground force capabilities.

Establishing intelligence collection and dissemination procedures to include timeliness, usability of form, pertinence, and security of gathered information.

Preparing a detailed rear area assessment for the TAOC and any deployed sites within its sectors.

ELECTRONIC WARFARE PLANNING

When the enemy has a known EW and electronic intelligence (ELINT) capability, the unit EW officer will assume an active role in EW planning for the TAOC. Planning considerations may

include—

Requesting a detailed assessment of the enemy's electronic order of battle to include communications and radar jamming capabilities and ARM capabilities and profiles.

Considering the EW threat when determining the locations of TAOC radars to include employment of ARM decoy equipment.

Providing input to the MAGTF command and control warfare (C^2W) plan.

Maximizing employment of secure communications and data links in the control and coordination of weapons platforms.

Ensuring that planners, operators, and users of electronic equipment thoroughly understand the EW threat and the EMCON/EP techniques used to counter that threat.

Submitting recommendations for EMCON and radiation control (RADCON) standards within the TAOC's assigned sector. The EMCON and RADCON plans should incorporate all ground-based sensors operating within the sector and consider the ARM threat with due regard to maintaining effective sector surveillance. EMCON and RADCON planning considerations should address—

Minimum communications (MINCOMM) procedures.

Use of brevity codes and authentication devices.

Use and security of communications security (COMSEC) materials.

Delegation of EMCON authority.

Signals security (SIGSEC).

Beadwindow calls (when it is believed that someone has committed a security breach over the net).

Gingerbread procedures (an intruder on the net).

Employment of directional antennas.

Circuit discipline.

Appropriate radio wattage.

Radar blinking and blanking.

Use of frequency diversity and frequency agile radios.

Physical dispersion and appropriate siting of communication emitters (to include radars, radios, and navigation aids [NAVAIDs]).

SITE SELECTION PLANNING

The site selection process begins once the TAOC's sector is addressed. During site selection planning, the planners must ensure that adequate space for site establishment, access to the site, and radar coverage of the sector are maximized. Further discussion of site selection planning and occupation is located in chapter 4. The site selection planning process includes—

Conducting surveys using maps, aerial photos, charts, and other graphic aids to identify candidate sites in concert with established air defense priorities.

Producing/obtaining radar coverage diagrams from the tactical

aviation mission planning system (TAMPS), Electromagnetic Compatibility Analysis Center (ECAC) studies, or manual computations.

Determining optimum siting locations for communications connectivity with higher/adjacent and subordinate agencies using applicable computer programs, LOS diagrams, and HF propagation predictions.

Establishing a phased plan of equipment arrival at the site to facilitate rapid commencement of operational capabilities and communications.

Selecting an advanced party to conduct a physical reconnaissance, locate positions for equipment, and stake out specific equipment sites.

Preparing site diagrams or models, which depict equipment locations and are the basis for setup crew briefings.

Ensuring site plans consider maximum dispersal and remoting of equipment to reduce EW/infrared (IR) signatures.

Designating alternate TAOC locations, which may be used if required.

Planning for additional EW/C sites, which may be used at short notice and with minimal prior preparation to support various tactical situations.

Submitting a list of candidate sites to the ACE commander based on map surveys and other studies. The siting considerations for the TAOC or EW/C should encompass all task-organized equipment and personnel in both movement and physical requirements. Site characteristics to be considered

include—

Ground that is level within ± 10 degrees.

Spatial requirements (e.g., antennas, radio frequency [RF] hazards). Note: ensure minimum of 300' separation when siting multiple sensors.

Logistic supportability.

Camouflage and concealment.

Trafficability and access.

Emergency destruction and/or movement.

Drainage.

Defendability.

Radar coverage of the assigned airspace/sector/vital area.

AIR DEFENSE-SPECIFIC PLANNING

The TAOC will augment the air defense specialists in preparing the MAGTF operations order. Critical decisions, including air defense apportionment and planning to achieve air superiority, must be addressed and answered during this phase. Preliminary site selections for air defense agencies are also finalized. Other planning efforts include—

Recommending/determining the identification of critical assets, vital areas, and air defense priorities.

Establishing coordination for and preparation of the ACE

surveillance plan. The ACE surveillance plan provides the foundation for all subsequent air defense operations and should consider all available means (electronic or visual) to detect, identify, and track air vehicles in the MAGTF's area of operations (AO). While the location of individual elements of the surveillance system radars, CAPs, airborne early warning [AEW], Stinger teams, etc.) will be influenced by many operational and topographical factors, every effort should be made to provide detection capabilities at all altitudes throughout the AO, with particular emphasis on likely threat avenues of approach. Overlapping and redundant surveillance coverage should be achieved where possible and a reliable, swift, and redundant communications plan should also be devised to ensure rapid dissemination of detections.

Establishing and coordinating air defense communications requirements with the ACE planners to ensure continuous AAW information flow.

Determining the operational procedures used to integrate AEW into the overall air defense system (e.g., orbit areas, crosstell procedures, data links, or communications).

Recommending air defense control measures including WEZs and return to force (RTF) procedures for inclusion in the MAGTF operations order.

Recommending employment options for air defense weapons platforms (radar/nonradar fighters, and Stinger) to the ACE.

Ascertaining the availability of air-to-air missiles (AAMs) and SAMs and the development of specific requirements for a resupply plan.

Coordinating with MAGTF/ATF/joint planners on establishing

airspace management and control procedures.

Planning for the tactical redeployment/alternate siting of AAW assets in response to changes in the surveillance plan, the threat, or the ground force positions.

Identifying the need for AEW platforms to supplement radar coverage.

Recommending tanker routing and orbit locations and assisting in developing AR requirements.

Participating in the preparation of the air defense appendix to the operations order based on an analysis of the enemy air order of battle and own systems' capabilities and limitations. The air defense appendix should include—

Centralized/decentralized operations procedures.

Autonomous operations procedures.

ROE.

Air defense warning conditions.

Air defense states of alert (SOA).

Air defense weapons control status.

Air defense identification procedures.

C^2 agency casualty plans/procedures.

WEZ configuration (missile engagement zone [MEZ]/ fighter engagement zone [FEZ] layouts).

Methods of coordination/deconfliction.

RTF procedures.

EMCON measures.

Track telling/cross tell procedures.

Data link configuration, connectivity, and priority.

Communications prioritization.

Control procedures.

Agency casualty plans.

ALTERNATE TACC/TADC PLANNING

Continuation of operations depends on established detailed agency plans. Although the TAOC is responsible for assuming the role of the Alt TACC/TADC should the TACC/TADC become a casualty, the SADC and his staff will usually assume this function. Planning considerations for assumption of alternate TACC/TADC functions should include—

Identification of those specific tasks the SADC, and staff, are capable of assuming. Obviously, the SADC staff will be unable to assume the future operations functions of the TACC. Likewise, the DASC may be better suited to assume certain TACC functions relative to OAS and Assault Support.

Predetermining procedures to initiate assumption of the Alt TACC role should the TACC become a casualty.

Establishing procedures and delineating functions to be performed by various MACCS agencies in the event of a TACC casualty.

Designating an Alt TACC facility.

Determining additional communications nets required by the Alt TACC.

Establishing predetermined SADC staff and TAOC crew responsibilities for assumption of the Alt TACC role.

Ensuring adequate situation displays are available should the TAOC assume the Alt TACC role.

EXTERNAL SUPPORT PLANNING

The TAOC's transportability is limited by amount and type of organic transportation assets available at the MACS. Unit planners should specify their desires concerning whether or not the TAOC or elements of the TAOC will remain mobile-loaded throughout the operation. If the decision is made not to mobile-load the TAOC or if assets are not available, sufficient transportation and MHE must be available to rapidly emplace the TAOC.

MHE must be able to access the TAOC's site and must be capable of lifting the TAOM shelter. Transportation assets should be of sufficient dimensions to hold the TAOM shelter. International Standards Organization (ISO) extenders are available from the TAOC should logistics vehicle system (LVS) assets be used.

JOINT/MULTINATIONAL PLANNING

The MAGTF must ensure its operations are integrated and coordinated with joint or multinational forces. A MAGTF representative must be included during the planning of joint operations (e.g., development of a joint air operations plan,

airspace control plan (ACP), or an area air defense plan). The MAGTF's AAW capabilities and requirements must be addressed during planning to ensure the joint force's support and accomplishment of the MAGTF's mission.

The ACE commander, his staff, and the MACCS, as the MAGTF's air operations and AAW experts, provide joint or multinational force planners with the MAGTF's AAW capabilities and requirements. They also identify MAGTF capabilities and requirements relative to airspace control and air defense operations. Specifically, joint and multinational operational plans must—

Integrate and complement the mission of the joint force.

Ensure the interoperability of equipment and personnel.

Ensure the common use and understanding of terminology.

Allow responsiveness and the massing of firepower whenever and wherever needed.

Identify the proper liaison and staff/agency representation between joint force components. (Representatives from each component must enable and improve the information flow and provide expertise.)

Outline procedures for airspace control and air defense degradation.

Facilitate transition from peacetime conditions to hostilities.

Air operations, airspace, and air defense planning are integrated with the joint force's planning cycle. Input from all components must be consolidated and integrated into the joint air operations

plan, the ACP, and the air defense plan. The ACP and area air defense plan are part of the joint air operations plan, and they must be included in the joint force operations plan. The airspace control order (ACO) is published and disseminated based on guidelines established in the ACP. The ACO may be issued as part of the joint ATO or as a separate document. The ACO normally covers 24 hours.

Chapter 4

Operations

The MAGTF commander uses Marine aviation to assist MAGTF efforts in support of the commander, amphibious task force (CATF), the naval expeditionary force (NEF) commander, the joint task force (JTF) commander, or the joint force commander (JFC) in preparing and defending the battlefield. In its most common employments, the TAOC will operate in support of amphibious or joint force operations. Through its support of these operations, the TAOC will manage the MAGTF's integrated air defense system (IADS).

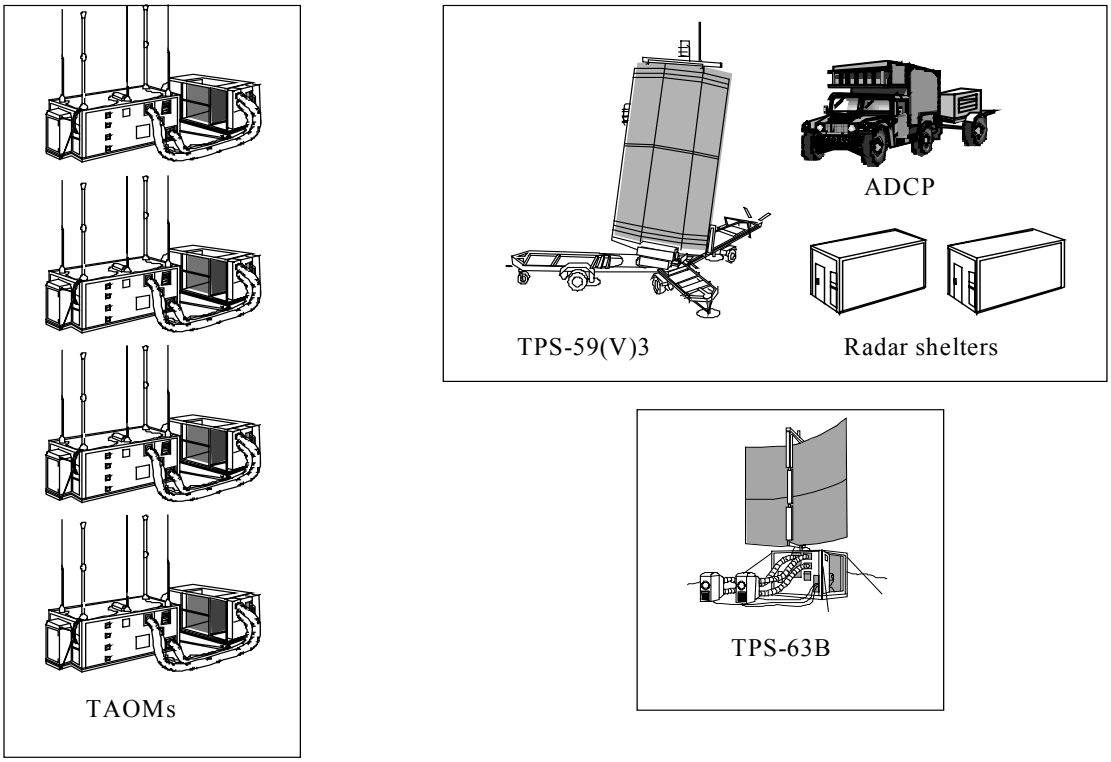
Employment options

The MACS's TAOC detachment will task-organize a system to meet the required capabilities needed to support its designated mission. This task organization may be as small as a single gap filler radar detachment or as large as the entire TAOC. Examples of TAOC employment options are described below.

TAOC

As the MAGTF's AAW and surveillance/data link facility, this configuration provides the operational capability to perform all air C^2 tasks associated with the TAOC as outlined in chapter 1. The TAOC site is normally employed for operations requiring high intensity levels of AAW, surveillance-identification, and airspace management activities.

A TAOC consists of four TAOMs, AN/TPS-59(V)3 radar with ADCP, *and an AN/TPS-63 radar*. TAOMs may disperse to the maximum practical extent afforded by their 500 meter fiber-optic cables. The AN/TPS-59(V)3 and AN/TPS-63B can disperse up to 2 kilometers from the TAOC while interfacing with the TAOC via a fiber-optic cable. Survivability is enhanced through employment of the AN/TPS-59(V)3's ARM decoys. Circuits and needlines required for coordination with higher, subordinate, and adjacent units will terminate at the TAOC. The TAOC will exercise aircraft control and supervision and coordination of air defense employment within its assigned sector.



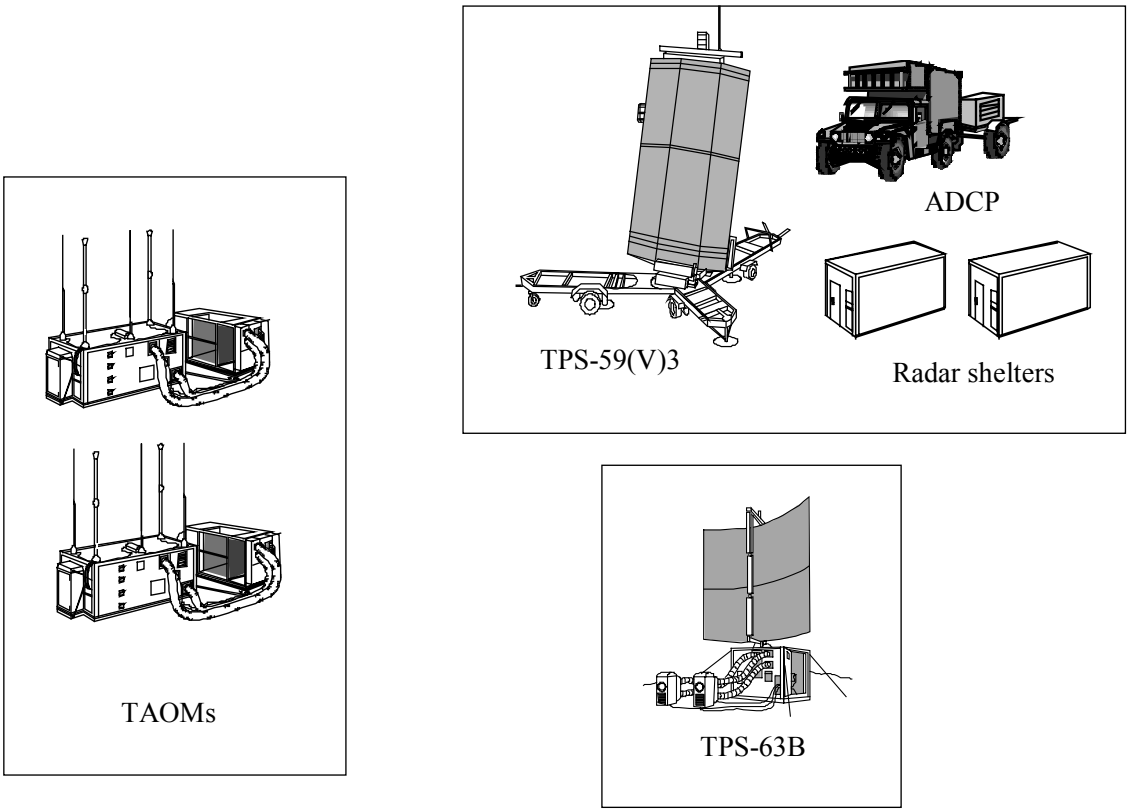
TAOC Configuration: (4) TAOMs, TPS-59(V)3 and ADCP, and TPS-63B

Figure 4-1. TAOC configuration

Early Warning and Control Site

An operational site capable of performing the majority of TAOC tasks, the EW/C site is primarily designed to perform air surveillance and aircraft and missile control. This site is not configured to perform the senior supervisory and coordination functions provided by a TAOC site. The EW/C site is employed for operations requiring medium intensity levels of airspace management and/or air defense control; or as a subordinate agency to a TAOC during high level AAW and airspace management control operations.

An EW/C site consists of one or two TAOMs and either one or both, AN/TPS-59(V)3 and AN/TPS-63B radars. It will be forward deployed to augment surveillance coverage of the TAOC's assigned sector and/or to act as an echelon platform for subsequent TAOC operations. The EW/C's primary responsibility is surveillance, but it may also be assigned limited CAP or GBAD control functions. Either radar may be deployed as an early warning radar site to augment the TAOC's surveillance coverage. This site may digitally link its radar picture to the TAOC over a single or multichannel remote radar link (often referred to as a remote radar site in this configuration).



EW/C Configuration: (2) TAOMs and either one or both radars

Figure 4-2. EW/C site configuration

Early Warning Radar Site

An operational site capable of performing a minimal number of TAOC tasks, the early warning site is usually limited to providing air surveillance information. This site consists of one radar and support equipment (no TAOM) and is employed for operations requiring low levels of airspace management and minimal air defense control or as a subordinate agency to a TAOC or EW/C in higher intensity operations. The site is used mainly to provide surveillance cueing, early warning, and/or to fill surveillance gaps. When the radar picture is electronically transferred to a TAOC or EW/C, the site is often referred to as a remote radar site. Because the early warning site does not include a TAOM, it does not provide a data link picture to other air C^2 agencies.

Either radar may be deployed as an early warning radar site to augment the TAOC's surveillance coverage. This site may digitally link its radar picture to the TAOC over a single or multi-channel remote radar link (often referred to as a remote radar site in this configuration).

Theater Missile Defense (TMD) Detachment

An AN/TPS-59(V)3 radar and air defense communications platform (ADCP) may be deployed as a theater missile defense (TMD) detachment.

A detachment is capable of detecting and tracking theater ballistic missiles. The TBM information is reported on TADIL-J via the ADCP.

Alternate Tactical Air Command Center Site

An operational site capable of performing limited TACC functions, which is assigned by the ACE commander in the event that the TACC becomes incapable of performing these functions. This function is normally assigned as an additional task/role of a TAOC and usually for a short duration (24 hours or less). The TAOC has the capability of performing many of the TACC's current operations section's (COS's) functions for a limited time. Note: The TAOC cannot produce an ATO. Personnel and equipment augmentation would be necessary to perform future operations sections (FOS) functions.

TAOC Configuration

The TAOM's modularity and flexibility affords planners a myriad of configuration options. A typical configuration is—

A TAOC consists of four TAOMs, an AN/TPS-59(V)3 three-dimensional radar and an AN/TPS-63 two-dimensional radar. TAOMs will disperse to the maximum practical extent afforded by their 500 meter fiber-optic cables. The AN/TPS-59(V)3 can disperse up to 2 kilometers from the TAOC while interfacing with the TAOC via a fiber-optic cable. Survivability is enhanced through employment of the AN/TPS-59(V)3's ARM decoys. Circuits and needlines required for coordination with higher, subordinate, and adjacent units will terminate at the TAOC. The TAOC will exercise aircraft control and supervision and coordination of air defense employment within its assigned sector.

An EW/C site consisting of two TAOMs and either one or both, AN/TPS-59(V)3 and AN/TPS-63B radars will be forward deployed to augment surveillance coverage of the TAOC's assigned sector and/or to act as an echelon platform for subsequent TAOC operations. The EW/C's primary responsibility is surveillance, but it may also be assigned limited CAP or GBAD control functions.

Either radar may be deployed as an early warning radar site to augment the TAOC's surveillance coverage. This site may digitally link its radar picture to the TAOC over a single or multi-channel remote radar link (often referred to as a remote radar site in this configuration).

Operational Principles

The enemy's air and missile threat to the MAGTF air defense system includes aircraft and TMs. In combating this threat, the MAGTF's air defense plan is based on employment of three key principles.

Destruction in-depth

Destruction in-depth is based on threat detection and destruction beginning as far away from the vital area as possible and continuing as long as the threat exists. The area required to ensure destruction in-depth is referred to as the destruction area.

Mutual Support

Mutual support stresses that AAW weapons are employed and/or located in a manner that ensures continuity of

engagement. Therefore, air defense units increase the probability of preventing the penetration of the AAW vital area by hostile aircraft and missiles.

Centralized Command and Decentralized Control

Coordinated operations and economy of force require centralized command. However, to achieve a system that has minimum reaction time and maximum damage resistance, the system requires a capability to function under decentralized control.

Concept of Employment

The TAOC task organizes its capabilities to meet air defense and airspace management needs for any MAGTF. It can support operations across the spectrum of MAGTF operations including operational maneuver from the sea, sustained operations ashore, and other expeditionary operations.

Marine Expeditionary Force

One TAOC is employed to support air operations for a Marine expeditionary force (MEF). The TAOC can be task-organized to meet the MEF's specific air defense requirements. The TAOC may be organized and equipped to operate independently in support of a variety of contingencies. Control of MEF AAW assets is coordinated with the TAOC under the cognizance of the TACC. In amphibious operations, an EW/C site can be established ashore initially and eventually built-up into a full TAOC. Each TAOC is established where it can best provide air surveillance, airspace management, and control of aircraft and missiles in its assigned sector.

Marine Expeditionary Brigade (MEB)

A Marine expeditionary brigade is supported by an EW/C site consisting of two TAOMs and either one or both, AN/TPS-59(V)3 and AN/TPS-63B.
In amphibious operations, the TAOC is established ashore.

Marine Expeditionary Unit

The reduced level of air activity normally associated with a Marine expeditionary unit (MEU) normally does not require TAOC services. Air control and airspace management functions are typically performed by US Navy air C^2 agencies. However, TAOC personnel can be deployed with a MEU to assist in airspace management planning and execution functions.

Interagency Relations

TAOC and TACC

The TAOC is subordinate to the TACC and provides decentralized control functions for air defense and airspace management for the ACE commander. In high-threat scenarios, the ACE commander may delegate authority to the SADC to divert/launch on-call air defense aircraft to meet the threat. The SADC may, in turn, delegate this authority to watch standers within the TAOC. This serves to minimize the response time to react to the threat. The TAOC is responsible for keeping the TACC informed of the current status of air defense and other AAW missions within its assigned sector, the status of AR aircraft, status of GBAD units, and portraying a timely air situation picture. In turn, the TACC provides the TAOC with the status of aircraft scheduled to support air defense missions.

TAOC and SADC (or RADC)

The SADC is the MAGTF's air defense battle manager. The SADC is responsible to the ACE commander through the TACC for the conduct of AAW within the MAGTF's AO. The TAOC is the SADC's principal agent for implementing his near term air defense plan. The TAOC provides the SADC with the current status of air defense and AR missions, status of GBAD units, the current threat situation, and other pertinent data necessary for the to effectively manage MAGTF, and attached, air defense assets. The SADC provides the TAOC with information regarding his intentions and management of air defense assets.

Assuming the MAGTF is designated a SADC/RADC within the MAGTF AO, the TACC and SADF/TAOC will normally split the execution and planning tasks as listed below:

TACC

- Publish and disseminate DIM
- Plan tactics to cover threat
- Coordinate training
- Coordinate Joint/Allied sea/land TAMD
- Accept TACON of regional AD forces

- Respond to intelligence cueing
- Direct weapon system firing policy
- Direct/coordinate AD attack operations
- Direct/coordinate passive AD operations
- Coordinate with higher AD units (AADC)
- Integrate AD efforts with other ACM's (ADCM)
- ACE CTP Manager
- Regional ICO (RICO)
- Designate the Executive Agent
- Disseminate ROE
- Coordinate AEW integration

SADF/TAOC

- Develop surveillance plan
- Monitor/coordinate engagements
- Direct/redirect engagements (as required)
- Evaluate threat
- Respond to intelligence cueing
- Coordinate RADCON
- Direct/coordinate active AD operations
- Coordinate with other AD units
- Coordinate with adjacent non-AD units
- Set ADWC/WCS/SOA/SOE
- Provide summary of AD activity for ACE/MAGTF OPSUM
- Disseminate ROE
- Regional TDC
- ID Authority (if applicable)

TAOC and DASC

The DASC disseminates air defense control measures received from the TAOC to applicable MAGTF elements, Stinger units, and aircraft under the DASC's control. The DASC provides friendly aircraft information to the TAOC to assist in the aircraft identification process. The DASC also coordinates the RTF of aircraft under its control with the TAOC.

TAOC and MATCD

The TAOC and MATCD coordinate aircraft departure and RTF information to assist in the aircraft identification and recovery process. The TAOC advises the MATCD on the current air threat situation and provides air warning data for the MATCD activation and control of the base defense zone (BDZ). The MATCD disseminates air defense control measures received from the TAOC to applicable MAGTF elements and aircraft under the MATCD's control.

TAOC in Amphibious Operations

Amphibious operations combine ships, aircraft, weapons, and landing forces (LF) into a united military effort against a hostile or potentially hostile shore. During the assault phase, air defense capabilities must be established and built-up ashore. These capabilities include LAAD, aircraft, surveillance assets, and air C^2 agencies. After MAGTF LF assets and units are established ashore, the CATF may transfer control of specified operations to the commander, landing force (CLF). As the MACCS becomes functional, the CATF may transfer control of all or various portions of amphibious objective area (AOA) air operations to the CLF.

Initial Air Defense Capability Ashore

Initially, ATF aircraft operating from supporting aircraft carriers provide airborne air defense ashore. Stinger teams (initially in direct support of the ground combat element [GCE]) represent the first dedicated, operational shore-based air defense capability responsible for low altitude threats.

Air Defense Build-up Ashore

As the LF's follow-on ACE, GCE, and combat service support element (CSSE) resources build-up ashore, additional air defense assets also phase ashore. During the build-up of MAGTF air defense ashore, Marine wing communications squadron (MWCS) detachments, Marine wing support squadron (MWSS) detachments, and MATCDs establish and operate forward operating bases (FOBs). FOBs allow MAGTF aircraft (including AAW capable platforms) to establish forward bases ashore. As FOBs are established ashore and LF aircraft begin using the FOB, GBAD assets must provide air defense. The early introduction of EW/C radar/control elements ashore extends shipboard weapons employment, radar surveillance, identification, and coordination/control capabilities. The EW/C site provides engagement and early warning, cueing, and surveillance capabilities against the enemy air and missile threat (including TBMs). General support Stinger platoon commander(s)/section leader(s) may collocate with the EW/C to facilitate the exchange of surveillance/identification information with the EW/C, landward SADC/RADC (Navy or Marine), and air warfare commander (AWC). The ACE commander (normally through the TAOC, via the SADC/RADC) activates MEZs and FEZs. The TAOC must coordinate flight paths to prevent landing force

aircraft from penetrating a MEZ unless absolutely necessary. Typically, the activation of a MEZ changes the RTF/ROE procedures used during the initial assault phase. All control agencies, controllers, and aircrews must adhere to the new RTF/ROE procedures. As additional general support Stinger assets move ashore, the remainder of the TAOC's equipment and personnel also phases ashore. Liaison is established with the landward sector SADC/RADC to coordinate MAGTF AAW operations. Once the TAOC and other GBAD assets are operational, they establish and maintain the required voice and digital information links with the landward sector SADC/RADC.

Transfer of Control Ashore

The CLF establishes air control facilities ashore as soon as possible. These facilities provide increased surveillance and quicker response and extend the ATF's weapons control capabilities. Initially, air control agencies ashore operate as an adjunct to agencies afloat. The TAOC and/or EW/C agencies ashore assist as needed and monitor air control aspects (including communication circuits) directly related to their tasking. The CATF decides when to pass authority from agencies afloat to ashore. Control agencies afloat continue to monitor communications and serve as a backup to shore-based air C^2 agencies in the case that the shore-based units become casualties.

Surveillance. Before transferring control of air operations to the MACCS units ashore, the ACE commander must establish an integrated and comprehensive surveillance plan for the MAGTF. Surveillance resources are employed ashore based on their capability and coverage. Therefore, the ACE commander, staff, and subordinate commanders must thoroughly analyze the surveillance requirements for the MAGTF's assigned sector addressing issues which include terrain and its masking effects, threat axis of attack, and available surveillance resources. Other factors to consider are—

The location of the TAOC and EW/C.
The ability of MATCDs to augment the surveillance system.
The location of Stinger/Avenger sections/teams (in general support/direct support).
FEZ(s) orientation.

ACE planners must also identify any other specific requirements for aircraft surveillance capabilities (e.g., AWACS or AEW) to the ACE commander. Once the surveillance system is established, the TAOC's surveillance section coordinates input from the TAOC's sensors and all other surveillance sources. Through this compilation of air track information, the TAOC is able to effectively identify detected air tracks and build a comprehensive air picture.

Control. As MACCS agencies are established ashore and become operational, tactical control of various portions of the air operation may be transferred ashore. WEZs are established and GBAD units are assigned specific MEZs. As the MAGTF's IADS of interlocking engagement zones is established, changes to RTF/ROE procedures may occur. Once the TAOC is ashore and operational, tactical control of landward sector air defense (including TMD) may be phased ashore to the LF (Marine) SADC. Once all MAGTF resources are operational, successful execution of the MAGTF air defense plan addresses asset apportionment/allocation, coordination, C^2, and management.

Post-Assault Operations

Once the amphibious assault operation ends and the ATF dissolves, the CLF begins post-assault operations. AAW operations conducted during the post-assault are similar to those performed during the assault. MAGTF aviation continues to

support the LF and can also coordinate with other Service air components.

Communication Nets

The MACCS's AAW assets (including aircraft) are communications dependent. An extensive communications network is required to handle the volume and time sensitive nature of the information involved in aviation operations.

AAW's communications with the ATF is through the ATF AAW control and reporting (AAWC&R) nets. The Navy tactical air control center (TACC) and Marine TACC, TADC, and TAOC are included on these nets. The TAOC will use fighter air direction (FAD) nets for CAP control, tactical air traffic control (TATC) nets for control of all other aircraft, anti-air intelligence (AAI) and antiair control (AAC) nets for GBAD control, and various command nets for coordination with the MACCS to include tactical air command (TAC), air operations control (AOC), and hand-over/ cross tell communications nets.

Marine Aviation communicates with the other services through the MACCS. The MACCS provides voice and data connectivity between Marine Aviation and joint services. The MACCS operates on all joint doctrinal communication nets and Tactical Digital Information Links (TADILs). The TAOC operates on: Air Defense Command and Control Net (ADCCN), Track Supervision Net (TSN), Data Link Coordination Nets (DCNs), Voice Product Net (VPN) and is a contributing participating unit in the data link architecture (TADIL-A, B, or J).

Joint and Multinational Operations

The MAGTF may operate as part of a joint or multinational force. If the MAGTF is supporting joint or multinational operations, the

MAGTF is assigned an AO by the JFC. The JFC should assign airspace control and air defense sector(s) that coincide with the MAGTF's air defense and airspace control assets and capabilities. Sector(s) normally include the MAGTF's zone of action and assigned objectives. The joint force's surveillance and AAW operations are conducted under the guidance of and in accordance with the objectives of the JFC. The JFC may designate an area air defense commander (AADC) to coordinate and integrate the joint force's entire air defense efforts and an airspace control authority (ACA) responsible for the overall operation of the airspace control system. The MAGTF should be assigned as SADC/RADC within the MAGTF AO. It is likely there will be attached air defense forces from other service components, allies, or coalition partners assigned TACON to the MAGTF within, or adjacent to, the AO.

Surveillance/Data Link Interoperability

As the primary surveillance agency in the MACCS, the TAOC will integrate its effort with the other Service/country's air C^2 agencies in joint or multinational operations. The TAOM facilitates the TAOC's interoperability with the joint force air C^2 agencies through the employment of various digital data links. The interface coordination responsibilities of the TAOC will be delineated in the OPTASKLINK. The TAOC surveillance section manages the surveillance and data link operations of the TAOC under the direction of the TACC ICO/RICO.

Antiair Warfare

The TAOC will perform its AAW mission under the direction of the SADC/RADC, who will coordinate MAGTF air defense operations with the AADC. The TAOC weapons section may be controlling both Marine and joint/multinational interceptors and SAW assets. The TAOC's air defense responsibilities will be

outlined in the TACOPDAT message and/or RADC Daily Intentions Message (DIM).

Airspace Control

The TAOC will serve as the primary airspace control agency of the MAGTF and will coordinate its efforts under the ACA. The TAOC's airspace responsibilities are also delineated in the TACOPDAT.

JOINT THEATER MISSILE DEFENSE OPERATIONS

Traditionally, AAW (including offensive antiair warfare [OAAW] and air defense) is focused on attacking enemy aircraft (before and after launch), airfields, air defense systems, and radars. Since evolving technology has expanded the threat to include TMs (TBMs and CMs) the role of AAW and the MAGTF IADS also must expand. The Marine Corps will conduct TMD as a subset of AAW. MAGTF TMD operations fall under MAGTF AAW operations in naval expeditionary, amphibious, and joint operations. Joint Theater Missile Defense (JTMD) is the integration of joint force capabilities to destroy enemy TMs before or after they launch. JTMD also includes the disruption of enemy TM operations through mutually supporting passive missile defense, active missile defense, attack operations, and C^4I measures.

Joint Theater Missile Defense Operational Elements

Passive Defense. Passive defense measures reduce the vulnerability and minimize the effects of damage caused by enemy TM attack. They include TM early warning; nuclear, biological,

and chemical (NBC) protection; and counter surveillance. Passive defense also includes such measures as deception, camouflage and concealment, hardening, EW, mobility, dispersal, redundancy, recovery, and reconstitution. Passive defense is the responsibility of unit commanders at all echelons. Within the MAGTF AO, passive defense operations within the SADC/RADC realm of authority will normally be coordinated within the TACC.

Active Defense. Active defense operations protect against a TM attack by destroying TM airborne launch platforms and/or destroying TMs in flight. These operations include multi-tiered defense-in-depth against enemy TMs through multiple engagements. Air, land, sea, space, and special operations assets are used to conduct multiple engagements. Active defense operations also include active EW that disrupts the enemy's remote or on board guidance systems. The JFC normally assigns overall responsibility for JTMD active defense operations to the AADC. Active defense forces are under the operational control of their component commanders. MAGTF active defense operations will normally be directed by the SADC/TAOC.

Attack Operations. Attack operations destroy, disrupt, or neutralize TM launch platforms and communications. Attack operations also destroy, disrupt, or neutralize TM logistics structures and reconnaissance, surveillance, and target acquisition (RSTA) platforms. TMD attack operations also include offensive actions taken by air, land, sea, space, and special operations forces. The JFC normally tasks component commanders to conduct JTMD attack operations within their assigned AOs. The TACC will normally coordinate attack operations with the MAGTF COC.

Command, Control, Communications, Computers, and Intelligence (C^4I) for JTMD operations must use existing joint and Service C^4I systems and resources. TMD C^4I is an integrated system of doctrine, procedures, organizational structures, facilities, communications, computers, and supporting intelligence.

TMD C^4I includes missile warning and cueing of defense systems by missile warning sensors and ground stations. C^4I provides command authorities at all levels with timely and accurate data and systems to plan, direct, and control TMD operations.

Doctrinal and Operational Parallel

JTMD operations parallel and fit within the existing doctrinal framework of AAW. JTMD active defense operations fall under active air defense. JTMD passive defense measures fall under passive air defense measures. JTMD attack operations fall under OAAW (US Marine Corps). JTMD C^4I uses existing joint and Service C^4I systems and resources. The MACCS provides C^2 for MAGTF AAW and TMD operations.

Theater Missile Defense

The TPS-59(V)3 is capable of detecting and tracking theater ballistic missiles (TBMs). Cueing information is sent to the ADCP via point-to-point data link (PPDL). The ADCP transmits the TBM information over JTIDS. The TAOM is unable to process the AN/TPS-59(V)3 TBM data but displays the information throughout the system received from JTIDs.

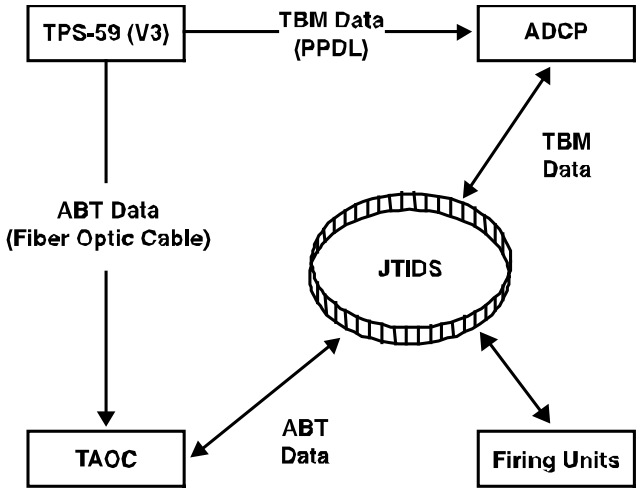


Figure 4-3. TMD Information Flow

TAOC SITING CONSIDERATIONS

The TAOC plays a crucial role in MAGTF air defense and anti-air warfare operations. Proper TAOC siting plays a major role in the TAOC's operational effectiveness.

Basic Site Considerations

The initial step in selecting a site for tactical command and control units equipped with TAOMs involves a detailed study of the area in which the mission is to be accomplished. This study is needed

to determine the most advantages locations for radar and communications equipment to accomplish the unit's mission. The site must lend itself to rear area security.

MCO 3501.9B lists the following considerations:

- Level ground within 10 degrees.
- Spatial requirements (e.g., antennas, RF hazards).
- Logistics supportability.
- Camouflage and concealment.
- Trafficability and access.
- Emergency destruction and/or movement.
- Drainage.
- Defendable.
- Radar coverage of assigned airspace/vital area.

Specific Siting Requirements

Once all of the general site considerations have been examined, specific requirements for particular equipment configuration must be examined.

Minimum Area Requirements. The amount of area required for a TAOC is based on how many TAOMs are to be collocated. The horizontal plane (footprint) of a single TAOM is 8 feet by 20 feet. In addition to the physical dimensions of the shelter, horizontal and vertical accesses must be considered for cable access, ducting, cable runs, etc. A clearance of 4 feet is needed on each side of the shelter, and 10 feet is needed on each end. Therefore, the minimum area required for a single shelter is 16 feet by 40 feet.

In addition to the TAOM ISO shelter area, the pallet assembly's area requirements must be considered. The minimum area required to contain a TAOM with its pallet assembly situated perpendicular to and the TAOM at the end opposite the TAOM's door is 16 feet by 47 feet.

If the TAOM is to be mobile-loaded during operation, additional

area must be added to the area calculations to allow for prime mover maneuvering.

Antenna Area Requirements. The TAOM can be employed with ground or roof-mounted antennas. Since roof-mounted antennas do not increase the footprint, they are not addressed here. As ground mounted antennas must be placed within a finite distance from their associated TAOM, each antenna's specific area requirements must be closely considered when selecting a TAOM site. Specific area requirements for each of the TAOM's antennas in a ground-mounted configuration are—

HF Whip. The space required to install the HF whip antenna with guide lines is 30 feet in diameter. The overall height of the antenna assembly is 27.2 feet.

UHF Antenna. The assembled UHF antenna's height is 22 feet, 6 inches. The recommended minimum installation area for the UHF antenna is 32 feet in diameter.

VHF Antenna. The overall height of the assembled antenna is 21 feet, 10 inches. The recommended minimum installation area for the VHF antenna is 32 feet in diameter.

HF Sloping Dipole. The erected antenna assembly is 21 feet tall and occupies an area 260 feet in diameter.

Radar Area Requirements. Care must be taken when emplacing radars to ensure no physical masking degrades radar coverage. Specific space requirements for the AN/TPS-63B are 30 by 30 feet to set-up. The AN/TPS-59(V)3 requires 100 by 200 feet to set-up.

Equipment Separation Requirements

Distance Between TAOMs and Ground-Mounted Antennas. Three factors determine the distance between a TAOM and its ground-mounted antennas: personnel safety, antenna isolation requirements, and hardware limitations. Each TAOM ground-mounted antenna's individual requirements are—

HF Whip. The separation between two HF whip antennas should be a minimum of 400 feet. Because of these separation constraints, two HF antennas cannot be roof-mounted on the same shelter and used at the same time. Special attention should be given to radiation patterns and reflective areas of the antennas.

UHF Antenna. The separation between two UHF antennas should be a minimum of 20 feet. Special attention should be given to radiation patterns and reflective areas of the antennas.

VHF Antenna. The separation between two VHF antennas should be a minimum of 40 feet. Special attention should also be given to the radiation patterns and reflective areas of the antenna.

HF Sloping Dipole. If multiple HF sloping dipole antennas are to be co-located, the separation between antennas should be a minimum of 260 feet mast-to-mast. Special attention should also be given to the radiation patterns and reflective areas of the antennas.

Distance Between TAOMs and Radars. The distance between a TAOM and a radar set is determined by the method of interface. The TAOM can interface with the radar set by one of two

methods: direct connection (fiber-optic cables) or indirect connection (remote radio sets). If fiber-optic cables are used, the maximum distance between the TAOM and radar set is limited to the length of the fiber-optic cables. The length of a TAOM's radar interface fiber-optic cable is 2,000 meters or 6,560 feet; therefore, a directly coupled radar set must be within a 6,560-foot radius from the TAOM. Operators should allow for adequate cable slack to prevent cable connector stress, which could damage the connectors when planning the TAOM-to-radar separation distances. If the remote radar interface capability of the TAOM is used, the maximum distance between the TAOM and radar is limited to 24 nm/40 km (software limitation).

Distance Between TAOMs. The minimum distance recommended between collocated TAOMs is 8 feet. This distance allows access to shelter cable connection panels, environmental control ducting, and adequate roof-mounted antenna separation. The maximum distance allowed between TAOMs is dictated by the inter-TAOM bus fiber-optic cables. The length of the inter-TAOM cables are 500 meters or 1,640 feet; therefore; the actual separation allowed between TAOMs must be less than 500 meters. When planning TAOM separation, allow for adequate cable slack to prevent cable connector stress. Excessive stress on the connectors could cause damage.

Distance Between TAOM and Pallet Assembly. The pallet assembly must be located within 25 feet of its associated TAOM.

Distance Between TAOMs and Power Sources. The TAOM requires 120/208 v, 3-phase, 50/60 Hz, configured prime power. It is obtained from either tactical generators or commercial power systems. Site location for prime power generators is determined by the location of the equipment they supply.

Chapter 5

Training

Every Marine Corps leader has the responsibility to establish and conduct technical and tactical training for Marines to successfully accomplish the unit's mission. The tools available to assist leaders in establishing the base for an effective training plan are relevance, standardization, efficiency, and specificity. Due to the complexities of amphibious, joint, and multinational operations, the importance of individual, crew, and unit level training for TAOC controllers and operators cannot be understated. The impact from meaningful, quality training will reflect on a Marine's proficiency.

INDIVIDUAL TRAINING

TAOC controller and operator training requirements are standardized by MCO P3500.19, *Training and Readiness (T&R) Manual.* It specifies training events and position requirements necessary for controllers and operators to progress through various level qualifications. Follow-on formal training is available to those Marines who demonstrate military occupational specialty (MOS) proficiency.

Formal Schools

Entry Level Training is conducted for air defense control officers (MOS 7210), tactical air defense controllers (MOS 7236), and air control electronics operators (MOS 7234) at Air School, Marine

Corps Communication-Electronics School (MCCES), Marine Corps Air-Ground Combat Center, Twentynine Palms, California.

Air Defense Control Officer Course provides instruction regarding TAOC system capabilities, employment and crew operations; system configuration; surveillance, traffic, and weapons functioning; principles of air defense; and air intercept control.

Air Control Electronics Operator Course provides the same instructional package as the ***Air Defense Control Officer Course*** withstanding the air intercept controller training portion.

Tactical Air Defense Controller Course provides intercept control training to corporals and sergeants carrying an interim MOS 7236 designation. Upon successful course completion, the Marine will receive a permanent MOS 7236 designation. The ***Air Control Electronics Operator Course*** is a prerequisite for the ***Tactical Air Defense Controller Course***.

Graduate Level Training is conducted for Air defense control officers (MOS 7210) and tactical air defense controllers (MOS 7236) exhibiting technical and tactical proficiency may be selected by their commands to attend mid- and high-level MOS training. Training includes the Navy Fighter Weapons School (TOPGUN), Marine Division Tactics Course (MDTC), and the Weapons and Tactics Instructor (WTI) course.

TOPGUN provides controllers with advanced training in threat and friendly air tactics; weapons systems capabilities; and Naval power projection doctrine. Prerequisites for TOPGUN include qualification as an air intercept controller instructor (AICI).

Marine Division Tactics Course provides controllers with ground

and practical application instruction in doctrine, tactics, and weapons employment considerations for a division or more of Marine fighters in a multi-bogey environment as part of an integrated air defense system. Marine aviation weapons and tactics squadron 1 (MAWTS-1) instructors teach MDTC

Weapons and Tactics Instructor Course provides students advanced training and practical application on planning and execution of the six functions of Marine aviation. MOS 7210 students receive specific instruction in MACCS and TAOC planning and SADC/TAOC operational execution. Prerequisites for WTI attendance include SAD qualification with MEF-level exercise experience. Upon completion, students receive MOS 7277 (weapons and tactics instructor) designation.

Follow-on Schools. Additional formal schools are available for field grade officers, including the Air Defense Control Officers Senior Course (ADCOSC) and the WTI Commanders Course.

Air Defense Control Officers Senior Course is conducted at Air Schools, MCCES, Marine Corps Air-Ground Combat Center, Twentynine Palms, California, the ADCOSC is designed to provide MACCS field grade officers with instruction on air defense capabilities and limitations. Conducted as a symposium, the ADCOSC provides insight to air defense operations and planning considerations.

WTI Commanders Course is held at MCAS, Yuma, Arizona, the WTI Commanders Course provides field grade officers with an opportunity to examine and discuss issues affecting the MACCS and considerations for MACCS employment.

On-the-Job Training

Most TAOC controller and operator MOS training is conducted at the squadron level. Requirements for both academic and practical application training and position qualification for TAOC controllers and operators are specified in MCO P3500.19. A specific T&R syllabus exists for MOS 7210 air defense control officers, MOS 7236 tactical air defense controllers, and MOS 7234 air control electronics operators. Tracking of individual readiness is computed by the aviation training and readiness information management system (ATRIMS). Training for TAOC controllers and operators is conducted at four progressive levels. Completion of each level equates to reaching a given level of combat readiness.

Combat Capable Training is completed at the MCCES entry-level school and includes the basic skills training required by TAOC personnel to operate TAOC equipment and function as a TAOC crewmember.

Combat Ready Training includes additional training in tactics and weapons systems in both permissive and restrictive threat environments to raise the skill level of TAOC personnel.

Combat Qualification Training. Upon completion of this phase, TAOC operators and controllers will be proficient in the employment of the weapons system in a sophisticated threat environment.

Completion of **Full Combat Qualification** indicates a Marine is proficient in the employment of the weapons system in integrated operations in all threat environments.

Special Qualifications. MCO P3500.19 provides guidance for TAOC crew members to attain designations as instructors for various T&R levels, flight supervisors, simulator operators and programmers, and in specific crew positions.

CREW TRAINING

For TAOC controllers and operators, maintenance personnel, and the SADF staff, TAOC crew training is normally affected through the use of the TAOM's built-in simulation capability. The TAOM's simulation program provides operators with the ability to design air defense scenarios of varying complexity based on the crew's training requirements. Crew training need not include the entire crew, but may be designed to specifically challenge an individual TAOC section (e.g., surveillance, traffic, or weapons) on its functioning and procedures. Crew training drills are extremely important for identifying crew shortcomings, enhancing inter-crew coordination, testing air control procedures, and preparing the crew to interface with external agencies.

UNIT TRAINING

Unit training involves that training necessary in preparing the TAOC to perform its mission. Unit training can take on many forms, including command post exercises (CPXs), simulated exercises (SIMEXs), and field training exercises (FTXs). During unit training, MACS personnel are intimately involved in preparing training plans and coordinating with higher, adjacent, and subordinate C^2 and support elements.

Marine Aviation Planning Problem Exercises

Marine Aviation Planning Problem (MAPP) exercises are low cost, low overhead training which allow commanders to train their staffs to perform special integration and control functions in a simulated environment. MAPP exercises are particularly effective for determining command and control requirements to support possible contingencies.

MACCS Integrated Simulated Training Exercise

The MACCS Integrated Simulation Training Exercise (MISTEX) is a MACG locally produced exercise, which involves detailed preparation of a simulated scenario and its subsequent execution at the MACCS level. The MISTEX can serve to prepare units for upcoming FTXs or contingencies. Individual Marine participation in filling a crew position during a MISTEX is a T&R requirement for position qualification.

Joint *System* Training Exercises

Similar to the MISTEX, joint *system* training exercises (JSTEs) provide integrated systems training that incorporates the challenges of integrating the MACCS in joint operations. JSTE scenarios have been developed to support joint C^2 training for probable contingency operations worldwide.

Other Unit Training

In addition to CPX and SIMEX type training, the MACS often deploys to the field to participate in FTXs. Field training provides a unit with the most beneficial training opportunities available, living and operating in conditions similar to that, which would be expected in real world operations.

EVALUATING TRAINING

The success of individual, crew, and unit training must be qualitatively measured to identify training deficiencies and create a baseline for designing future training. Evaluation tools to identify training deficiencies are MCO 3501.9B, *MCCRES*, and MCO P3500.19. The MCCRES is a standardized; Headquarters Marine Corps directed evaluation program designed to measure a unit's warfighting readiness. It specifies mission performance standards (MPS) which agencies are expected to perform during their wartime mission. MCO P3500.19 specifies individual performance standards.

Appendix A

Crew Briefing Guide/Format

OPERATIONS BRIEF

The operations brief should be developed based on planning conducted at the MACCS (MACG) planning staff level. As such, it will incorporate specifics from the MACCS commander's brief, however, it must be appropriately tailored for the TAOC. The operations brief should incorporate specific issues to the MACS, beyond the scope of the commander's brief, which are required for effective TAOC employment.

The operations brief is designed to provide the TAOC detachment commander with a standardized, comprehensive, and concise format to brief critical TAOC crew members and the SADC for an operation or exercise. The briefing format will then allow TAOC crews to develop and present their crew briefs prior to execution.

The format for this operations brief is not designed to script every possible item that could be included in a TAOC crew brief, nor do all the items listed need to be included. The individual developing and presenting this brief must analyze the information presented in the MACCS commander's brief, determine which information is critical to the TAOC's mission accomplishment, and tailor his brief to meet these needs. The operations brief format follows:

General Situation

Enemy Forces

Ground forces disposition:

- Enemy troop locations
- Forward edge of the battle area (FEBA)
- Projected movements

Locations of known/suspected airbases

Location, Number, type, and variant of aircraft:

- Fixed-wing
- Rotary-wing
- UAVs

Possible loadouts/ordnance/delivery techniques:

- Air-to-surface missiles (ARM/general/theater)
- Precision guided munitions (forward-looking infra-red radar [FLIR]/TV/laser/command)
- Iron bombs
- NBC capabilities
- Infrared countermeasures (IRCM) capabilities

Enemy air capability to target air defense priorities

EW threat:

- Airborne/ground electronic warfare support (ES) systems/ capabilities
- Airborne/ground electronic attack (EA) systems/capabilities

Locations/systems/capabilities of SAM threat

Surface-to-surface threat to C^3 and air defense priorities

Special operations/terrorist threat

Expected air threat axis and likely avenues of approach

Expected times of attack

Most likely enemy course(s) of action

Friendly Forces

Airfields and locations/divert

Aircraft mission, locations and loadouts:

- Fixed-wing
- Rotary-wing
- UAVs

C^3 agencies, capabilities, and locations

Commander's Intent

Main effort/friction areas

Strengths to exploit

Vulnerabilities enemy may exploit

TAOC mission

Joint/Multinational Interoperability Issues

Interface with JFACC/ACA/AADC

Airspace control area/sectors

Air defense area/region/sector

Interface with International Civil Aviation Organization (ICAO) and host nation air traffic control (ATC) facilities

ATO input and receipt means/procedures

Command, Control and Communications Employment Plan

Air defense priorities

Surveillance coverage and radar contracts

Responsiveness to the threat

Destruction area (BDZs/MEZ/FEZ/crossover zones/points/ joint engagement zones [JEZs])

Data links:

Connectivity/configurations

- Interface control unit (ICU)/interface coordination officer (ICO)

Manual cross tell procedures

Orbit areas (AEW/CAP/tankers/CAS stacks/EA/ES)

Routing (minimum risk routes [MRR]/fade/bugout/IFF turn on and off lines)

Airspace coordination areas (ACAs)

Additional airspace control measures

NAVAID (tactical air navigation system[TACAN]/VHF omnidirectional range [VOR]/nondirectional beacon [NDB]) loca- tions

Lame duck procedures

CAP management and control

Tanker management and control

AEW/airborne agency coordination procedures

Aircraft handover procedures

Initial air defense warning condition/weapons control status

Initial states of alert (aircraft/Hawk/Stinger/air defense artillery [ADA])

Initial GBAD/CAP mode of control:

- Authority to change mode

Procedures for autonomous operations

ROE:

Identification (ID) authority

Engagement authority

ID criteria

Commit criteria

Self-defense criteria

Impact of night on ROE

Tactical recovery of aircraft and personnel (TRAP)/medical evacuation (MEDEVAC):

Assets/locations

Casualty collection points

Zones/safe areas

Communications:

Planned and exceptions; current period for communications-electronics operating instructions (CEOI)

Critical information flow

Communications assignments:

Frequencies/callsigns

Required communication nets to be monitored

Prioritization for restoration

Data link specifics:

Data link reference point (DLRP)/unit system coordinate center (USCC)

NCS

Frequencies/nets/callsigns

Addresses (Btrys/PUs/RUs)

Track blocks

Crypto change times

EMCON/EP plan to include RADCON and ZIPLIP procedures

Codewords

Required reports (equipment/frequency interference reports (FIR)/meaconing, intrusion, jamming, and interference (MIJI) to include required times or time of event)

ATO distribution to subordinate agencies

Intelligence connectivity

Casualty procedures:

Functional degradation

Data link and voice communications

Delegation of authority:

CAP launch

WEZ activation/deactivation

RADCON management

Time Hack

Questions

TAOC CREW BRIEF

Principal TAOC crew members conduct organized briefings prior to assuming the watch. Crew briefs should be as detailed as practical, however, may be abbreviated to expedite the group brief and concentrate on TAOC section particulars either prior to or immediately following the crew's mass brief. The normal briefing order is the—

SAD (Introductory Comments)

Intelligence representative

SCC

SID

STD

SWD

SAD

SADC/RADC /ACE commander/senior watch officer (SWO)

The minimum required information to be passed in the TAOC crew mass brief is specified in MCO 3501.9B. This information, combined with other additional useful information, is outlined on the following pages.

Intelligence Representative

Weather:

- Current airfield/operating area conditions
- 6-hour forecast for airfield(s)/operating area
- Divert field conditions

Friendly ground situation

Friendly air situation

Enemy ground situation:

- Special operating forces (SOF) and activities
- Operations impacting on friendly operations

Enemy air situation to include the air order of battle:

- Locations of known or suspected airbases
- Number and type of suspected aircraft threat
- Possible ordnance loads and configurations
- Aircrew training level
- Missile order of battle
- High-speed anti-radiation missile (HARM) capabilities and tactics
- Attack profiles

Enemy naval order of battle

Enemy electronic order of battle

Enemy surface-to-surface weapons capabilities

Enemy surface-to-air capabilities and locations

Vulnerability windows

NBC capabilities and employment means

System Configuration Coordinator

System configuration/equipment status:

Mass memory units (MMU) (to include Master MMU)

Radar interface units (RIU)

Computer units (CU)

Communication interface units (CIU) (to include Master CIU)

DDB

Printer units (PRU)

Data communication units (DCU)

Data terminal sets (DTS)

- Communication configuration/status:
  - Direct access trunks (DAT)
  - Single destination (SD) nets
  - Multi-destination (MD) nets
  - UHF nets/channelization
  - Crypto assignments
  - Switchboard access
  - Phone numbers
  - Hot lines
  - Other circuits
  - Data communication:
    - SADF
  - Radar voice control access units (VCAU)
  - SADF VCAU
- Radar availability
  - AN/TPS-59 radar, IFF, Mode IV
  - AN/TPS-63 radar, IFF, Mode IV
- Seating positions
- System degradation and manual reconfiguration procedures

Crypto changeover times

Authentication devices and location

Required reports

Surveillance Identification Director

TAOC's sector of responsibility:

Warning areas

Civil air routes

Restricted areas

Area restrictions

High-density airspace control zone (HIDACZ)

Area entry/exit points

Available radars to include minimum and maximum range

Terrain features affecting radar detection

Threat air axis and likely avenues of approach

Surveillance section (i.e., SOs') sectors of responsibility (Sectors should overlap between SOs)

TAOC acquisition, threat, and auto ID modes

System configuration:

Sector inhibits

- Censor areas
- Clutter gates
- Declination
- Radar tilt
- Radar throttling
- Threat zones
- Hostile/missile profile data

Identification criteria:

- IFF/selective identification feature (SIF) information
- IFF turn on/off lines
- Mode I, II, and III information
- Aircraft identification profiles

Classification criteria (with flow chart)

Theater/national asset identification assets and capabilities

Data link configuration:

- TADIL-A
- TADIL-B
- TADIL-J
- ATDL-1

Link 1

Responsibilities (i.e., ICU, track data coordinator [TDC], force track coordinator [FTC], NCS, etc.)

Participants with PU/RU assignment

Track block assignments

Primary/alternate configurations

Processing of near-real time (NRT) tracks

Filters

Manual cross tell procedures

EMCON:

RADCON plan

ZIPLIP procedures

EP plan/procedures

ARM profiles/parameters

Stop buzzer frequency/channel

Applicable brevity codes/codewords

Current ZIPLIP/RADCON

Section symbol management responsibility

Reports required (to include MIJI/frequency interference report [FIR] and report routing)

Surveillance responsibilities in the Alt TACC role

Section internal and external communication requirements

Section casualty procedures

Senior Traffic Director

Non-air defense fixed-wing events scheduled on the ATO:

DAS packages

Joint/non-US events

Stealth events

Check-in/out points and altitudes

Approach and departure routes

Tactical routing and major contact points (CP) for air defense and itinerant aircraft

RTF/MRR routing and procedures

Known safety of flight hazards

Location/status of NAVAIDs

Military and nonmilitary airspace considerations:

No fly areas

No fire areas

Restricted areas

- Operating areas
- Deconfliction procedures with civil airways/Federal Aviation Administration (FAA)
- Visual flight rules (VFR)/instrument flight rules (IFR) regulations

Handover/takeover procedures (both internal and external)

Tanker information:

- Slide and Retrograde plan
- Track locations
- Join-up procedures
- Giveaway amounts
- Scheduled tanking events
- Prioritization

AEW and airborne ELINT tracks and/or orbits

Emergency procedures

Search and rescue (SAR) procedures:

- SAR unit location and type
- Availability

Launch authority

Coordination procedures

Hung ordnance procedures/drop locations

Appropriate codewords/brevity codes

Symbol management

Traffic section responsibilities in the Alt TACC role

Reports required

Section communications (internal and external)

Section casualty procedures

Senior Weapons Director

Air defense assets in the sector under TAOC control to include alert/readiness states, fuel, weapons loadouts, and locations:

Fighter aircraft (radar, visual CAP)

Alert/readiness states

Fuel

Primary and alternate weapons loadouts

Fighter locations

Dedicated air defense tanker support

SAW units

CAP/FEZ manning priorities

Relief plan for aircraft, likely friendly tactics to be

employed (section, division, etc.), and FEZ manning priority

Radar contracts with radar fighters

Air defense priorities

Utilization of weapons engagement zones (MEZ, FEZ):

Activation/deactivation plans

Casualty plans

Data link connectivity

Manual tell procedures

Air defense warning and weapons release conditions to include authority to set conditions

Rules of engagement:

Beyond visual range (BVR) criteria and authority

Electronic identification (EID) criteria

Visual identification (VID) criteria

Air raid warning procedures

Emergency actions to be taken by aircraft, controllers, and SAW units

Fire control orders

Routing within the IADS

Information flow requirements:

- Critical vs noncritical
- Controller/aircrew cadence

Air defense warning and release conditions

Air raid warning procedures

Positive and procedural control measures

TADIL-C operations

Alternate and supplemental sites for SAW units

Communications:

- Communications brevity procedures/codewords
- Secure communication means
- Gingerbread/authentication procedures
- Internal communications
- External communications

Weapons section responsibilities in the Alt TACC role

Reports required

SAW casualty procedures

Section casualty procedures

Senior Air Director

System configuration priorities

Concept of operations:

- TAOC's role in AAW
- Location of higher/adjacent/subordinate units
- Command relationships
- ACE commander's guidance
- Coordination procedures for higher and adjacent air defense agencies

Status of phasing air defense responsibilities ashore

Alternate TACC/TADC procedures

TAOC casualty procedures:

- Rally point
- Unit(s) to assume TAOC functions
- Personnel augmentation requirements

Alternate TAOC locations

Coordination requirements with the SADF

Safety requirements (regarding both air and ground safety)

Communications requirements (internal and external)

Individual casualty procedures

Administrative information:

- Watch schedules
- Camp security responsibilities
- Special instructions
- Sitdown time

Classified Material (verify)

- Location and responsibility
- Documents
- Fill devices and CIKs
- Crypto changeover times (classified)
- Crypto fill deletion times (classified)

Crew relief procedures

- Time and location of debrief
- Time hack

Questions

Appendix B

Alternate Tactical Air Command Center Procedures

The SADF and/or TAOC may be required to assume the Alt TACC role in those situations where the Marine TACC/TADC is unable to perform all or part of its mission. Activation of the Alt TACC usually occurs as a result of one of the following conditions:

TACC/TADC as an operational casualty. The TACC's declaration as an operational casualty is the most severe situation in which the SADF and TAOC would be required to assume the Alt TACC role. The unexpected loss of functions may occur when the TACC/TADC sustains either significant equipment loss or damage or personnel casualties.

TACC/TADC movement/echelon. When the TACC/TADC would not maintain an austere manual capability during its movement and subsequent build-up to full operational capability, the SADF and/or TAOC may function as the Alt TACC.

ROLE

The Alt TACC provides limited TACC/TADC operational functions for command continuity when the TACC/TADC becomes a casualty for a limited or specified period of time. This highlights two key limitations of the Alt TACC.

Limited Functions

The Alt TACC is designed to assume only those functions associated with the TACC/TADC's COS. The Alt TACC is responsible for coordinating and supervising the execution of the current day's ATO. Alt TACC functions do not include promulgation and distribution of ATOs.

Limited Operations

The Alt TACC is designed to function for only a limited or specified period. Alt TACC operational periods should be measured in terms of hours (i.e., through the end of the crew watch or to the completion of the current ATO) rather than days. The SADF and TAOC are limited by both the personnel and equipment required to support sustained Alt TACC operations. TACC/TADC functions are returned to the TACC/TADC once it is able to perform its functions manually.

PREREQUISITES

Assumption of the Alt TACC role is contingent on certain circumstances and events.

TACC/TADC as an Operational Casualty

The TACC/TADC must be declared an operational casualty. Confirmation may be received from higher headquarters or from adjacent agencies. When MACCS agencies have lost communication with the TACC/TADC for a preplanned, specified

period, the SADF and TAOC will initiate procedures to assume the Alt TACC role. Before assuming the Alt TACC role, the TAOC will—

Attempt to contact the TACC/TADC on all required nets to include secondary paths and circuits.

Contact other MACCS agencies in direct communication with the TACC/TADC (i.e., the DASC and MATCDs) and request they attempt to contact the TACC/TADC on applicable communication circuits.

Request the TAOC's systems control (SYSCON) and technical control (TECHCON) facilities contact the MAW SYSCON to confirm or deny that the TACC/TADC is a casualty.

Direct an airborne aircraft to attempt contact with the TACC/TADC on UHF/VHF circuits, which the TACC/TADC is required to monitor.

If the above actions do not result in contact with the TACC/TADC by any agency, the TAOC will assume the Alt TACC role.

Notification by the TACC/TADC Prior to Loss of Functions

When the TACC/TADC is planning movement to a new/alternate location, the TACC/TADC may coordinate with the SADF/TAOC to designate a period in which the Alt TACC will be activated. This situation allows for a coordinated phasing of Alt TACC functions to the SADF and TAOC, thus facilitating the assumption of TACC/TADC operational functions.

ALT TACC FUNCTIONS

Upon assumption of the Alt TACC role, the SADF and TAOC will assume certain functions associated with the TACC/TADC COS. They include:

Coordinating USMC air defense efforts with joint/multi-national service agencies.

Integrating MACCS data link participants with joint/multi-national services.

Acting as the operational point of contact for execution of the daily ATO.

Coordinating with Marine aircraft groups (MAGs) to ensure adequate aviation resources are available to execute the ATO and to determine availability of additional aircraft sorties to meet immediate aviation requirements.

Managing MAGTF aviation resources to include strip launch and divert authority to meet immediate aviation requirements.

Establishing EMCON postures for the MACCS commensurate to the radio-electronic threat.

Processing and coordinating SAR and TRAP efforts within the assigned AO.

Realigning/retasking aircraft to meet changes in both the air and ground threat or the MAGTF commander's focus of effort.

Maintaining current friendly and enemy ground and air situation information to include the ground, air, and missile orders of battle.

ALT TACC FACILITY

The Alt TACC will normally be located within the SADF facility.

Situation Displays

Situation displays are used to provide the Alt TACC staff with a means to monitor the current and projected air and ground situation. A typical Alt TACC will include the following situational displays.

Air Defense. The air defense situation display provides information on the current status of both airborne and ground-based air defense assets.

ATO Displays. ATO displays are used to graphically display and to provide tracking of the current ATO. Generally, an air defense and air support ATO display will be included in the Alt TACC facility.

Communications Display. The communications display normally includes a listing and location of communication nets located within the Alt TACC facility and various unit callsigns.

Status Display. The status display provides information on the operational status of various MACCS agencies.

Cross tell Display. The cross-tell display graphically depicts the current air situation. The cross tell board may either augment or be used in lieu of an automated (data link) presentation in the Alt TACC facility.

Intelligence Displays. Intelligence displays are maintained by the squadron's intelligence Marines and will include a depiction of the enemy ground order of battle, air order of battle, and missile order of battle. Intelligence Marines will also provide maps and status

information on the friendly ground situation and scheme of maneuver, air assets by location, and missile locations for SAM units.

Communications

Upon assumption of the Alt TACC role, certain communication nets not normally guarded by the SADF/TAOC must be activated. An exact delineation of nets the Alt TACC needs to guard is exercise/operation specific. However, certain nets are generic to any situation.

Tactical Air Request/Helicopter Request (TAR/HR) Nets. These nets provide a means for forward ground combat elements to request immediate air support. Intermediate ground combat echelons monitor the net and may approve, disapprove, or modify the request. After the request has been filled, the DASC uses the net to brief the requesting agency on the details of the mission. Damage assessments are also passed. Other net participants include terminal controllers and the force fires coordination center (FFCC)/fire support
coordination center (FSCC). The TAR net may be designated for use in either the HF or VHF spectrum.

Tactical Air Direction (TAD) Nets. TAD nets provide a means for the direction of aircraft in the conduct of offensive air support missions and for the DASC to brief support aircraft on target information or assignment. Normally a VHF or UHF net, TAD nets are also monitored by terminal air controllers (e.g., forward air controller [airborne] [FAC(A)], tactical air coordinator [airborne] [TAC(A)], tactical air control party [TACP]).

Direct Air Support Net. The direct air support net provides a means for the DASC to request direct air support aircraft from the TACC/TADC. In addition to requesting direct air support aircraft, the direct air support net may be used to report/request aircraft

stationing, fuel and ordnance states, and the progress of ongoing direct air support missions. HF is the normal medium used.

Airboss Connectivity. Communication between the Alt TACC and the airboss is essential to provide the airboss with information on ATO changes and to determine aircraft status or availability from the MAGs.

Digital Communications. Responsibilities on data link management or participation requirements should be outlined in the applicable OPTASKLINK. Data link networks may require reconfiguration following a TACC/TADC casualty.

ALT TACC MANNING AND RESPONSIBILITIES

Upon notification that the TAOC will assume the Alt TACC role, SADF and TAOC crew members will take on additional responsibilities associated with the Alt TACC function.

SADC/RADC

The SADC/RADC will assume the duties as the ACE SWO until such time that another SWO is designated or until the TACC/TADC is prepared to reassume its duties. The SADC/RADC will be responsible for the coordination and execution of all aviation tasks occurring within the MAGTF's AO. The SADC/RADC will also be responsible for overall coordination of the Alt TACC crew.

SADC/RADC Watch Officer

The SADC/RADC Watch officer will assume the responsibilities normally associated with the TACC/TADC's air defense coordinator (ADC) and tactical air watch officer (TAWO). The SADC/RADC Watch officer is responsible for planning and allocating air defense aircraft to air defense control units within the MAGTF's AO. Further, he is responsible for recommending changes to the SWO (SADC/RADC) regarding RADCON, air defense, and weapons release conditions. The SADC/RADC Watch officer will also coordinate directly with the airboss to determine the current status and/or availability of fixed-wing assets to either meet the current ATO's requirements or to meet changes in the threat situation.

GBAD Representative

The GBAD representative will assist the SADC/RADC Watch officer in the execution of his tasks.

SADC/RADC Plotters

Plotters will continue to track the fixed-wing ATO and maintain the crosstell board.

SADC/RADC Intelligence Officer

The intelligence officer will assume the responsibility of coordinating intelligence dissemination within the MACCS.

Senior Air Director

The SAD will coordinate TAOC crew functions and provide additional Marines to man the Alt TACC. The SAD will also coordinate directly with and advise the SADC/RADC on the current status of all air activity within the MAGTF's AO.

Senior Weapons Director

The SWD will coordinate with and advise SADC/RADC Watch officer on all matters pertaining to the threat's air activities. In the absence of a SADC/RADC Watch officer, the SWD will assume those functions of the TACC/TADC ADC.

Senior Traffic Director

The STD will continue to monitor the DASC handover net and will establish communications for rotary wing check-ins. The traffic section in conjunction with SADC/RADC Watch officer is responsible for coordinating directly with the DASC to maintain timely information concerning the status of CAS and assault support missions.

The traffic section will be responsible for guarding the direct air support and TAD net(s). The direct air support net is normally the key coordination net between the TACC/TADC and the DASC. The TAD net(s) is used to both monitor the status of fixed-wing aircraft assigned CAS missions and to provide aircraft with briefs prior to conducting their CAS missions.

When additional radio net operators are not available, the traffic section will assume responsibility for monitoring the TAR net and maintaining the current status of ongoing and pending tactical air requests.

Surveillance Identification Director

The Surveillance Identification Director (SID) will assume those functions normally associated with the TACC/TADC's ICO and TDC. Assignments for primary and secondary responsibilities for these tasks are normally outlined in the OPTASKLINK. These functions may include assignment/designation of primary surveillance areas for military radar units, designation/maintenance of track production areas, assumption of track data coordination functions, reconfiguration of digital data links to ensure a comprehensive air picture is maintained, and coordination with data link participants external to the MACCS. Other data link machine functions may need to be assumed to include acting as the TADIL-A NCS or gridlock reference unit (GRU). The SID will also coordinate manual cross-tell responsibilities for surveillance agencies within the MAGTF AO.

Net Operators

Additional net operators will be required to monitor the TAD, direct air support, and TAR/HR nets. If a sufficient number of Marines are not available in the current TAOC crew manning, additional operators need to be called in to augment the additional radio monitoring requirements.

Rotary-Wing Functions

Tasks associated with monitoring and coordinating the rotary-wing ATO's execution will normally be delegated to the DASC. The DASC, in turn, will report to the Alt TACC the current status and projected shortfalls of assault support functions. If not already authorized, the DASC will be delegated strip launch authority for assault support missions and divert authority for immediate MEDEVAC missions. Functions of the TACC/TADC's rotary-wing tasker, which include direct coordination with the rotary wing MAG(s), will also be delegated to the DASC.

SPECIAL CONSIDERATIONS

Special planning considerations will be warranted when the TACC was tasked with specific duties as RADC, RICO, Component Rescue Coordination Center (RCC), etc.

AUGMENTATION

When the Alt TACC is expected to function for an extended period of time or when adequate coordination can be accomplished prior to the TAOC assuming Alt TACC functions, both communications and personnel augmentees may be required/requested.

Communications Augmentation

The requirement for additional communications equipment and operators is situationally dependent. Projected requirements for long-haul and multi-channel communication assets and necessary needlines should be considered during the planning cycle. Depending on the TAOC's requirements for air-to-ground communications, additional UHF assets may also be required to perform Alt TACC functions.

Personnel Augmentation

The TAOC is not organized to perform Alt TACC functions for an extended period. Therefore, if the TAOC is expected to assume Alt TACC functions for longer than normally expected (i.e., beyond the end of the crew watch or ATO day) the TAOC will require augment personnel from other units. When requesting augments, the TAOC should specify that sufficient personnel should be provided to man two 12-hour crews. The augments would include—

SWO - one per crew.

Intelligence representatives - two per crew.

Fixed-wing tasker- one per crew.

Rotary-wing tasker- one per crew.

Close Battle Coordinator- one per crew.

Plotters - two per crew.

Radio net operators - two per crew.

UNIT TASKS

In preparation for assumption of Alt TACC responsibilities, the following should be accomplished.

Administrative Officer

The squadron administrative officer will assist the operations officer in preparing any messages requiring release in the case of assumption of Alt TACC responsibilities.

Intelligence Officer

The squadron intelligence officer will—

Maintain current information on both friendly and threat ground, air, and missile orders of battle and ensure this information is posted in the SADF.

Coordinate with the TACC/TADC on intelligence matters impacting on future friendly ground operations.

Be prepared to act as the intelligence dissemination point for the MACCS if the TACC/TADC becomes a casualty. Should the TACC/TADC become a casualty, specific preparations should be in place to receive the required MACCS intelligence support as Air Combat Intelligence (ACI), a component of the TACC/TADC) was likely providing this support.

Operations Officer/TAOC Detachment Commander

The MACS operations officer/TAOC detachment commander will—

Coordinate with the TACC/TADC on probable actions to be taken if the TACC/TADC becomes an operational casualty.

Ensure the SADF is functionally designed and prepared to meet Alt TACC requirements.

Determine and request (if necessary) Alt TACC personnel augmentation if the TAOC is to assume Alt TACC functions for an extended period.

Coordinate with the communication-electronics officer to ensure required Alt TACC nets are designated in the radio guard chart or Annex K to the OPLAN/OPORD.

Ensure Alt TACC procedures are included as an integral portion of each TAOC crew brief.

Services/Supply Officer

The services/supply officer will coordinate with the Operations Officer/TAOC Detachment Commander on Alt TACC requirements.

Communication-Electronics Officer

The communication-electronics officer will—

Coordinate with the operations officer to ascertain and designate additional operational net requirements, should the TAOC be required to assume the Alt TACC role.

Determine additional communication augmentation required for assumption of Alt TACC responsibilities.

Ensure alternate voice and data communication paths designated in Annex K are sufficient to meet MACCS requirements should the TAOC assume the Alt TACC role.

Plan for and be prepared to activate needlines to airbases and joint/multinational service agencies in support of Alt TACC operations.

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Appendix C

Glossary

Section I
Acronyms

AAC	anti-air control
AADC	area air defense commander
AAI	anti-air intelligence
AAM	air-to-air missile
AAW	anti-air warfare
ABT	air breathing target
ACA	airspace control authority
ACA	airspace coordination area
ACE	aviation combat element
ACEOC	air control electronics operator course
ACO	airspace control order
ACP	airspace control plan
ADA	air defense artillery
ADC	air defense coordinator
ADCOC	air defense control officers course
ADCOSC	air defense control officers senior course
ADCP	air defense communications platform
AEW	airborne early warning
AIC	air intercept controller
AICI	air intercept controller instructor
Alt TACC	alternate tactical air command center
Alt TADC	alternate tactical air direction center
AO	area of operations
AOA	amphibious objective area
AOI	area of interest

AOC	air operations control
AR	aerial refueling
ARM	anti-radiation missile
ASWO	assault support watch officer
ATC	air traffic control
ATDL-1	Army tactical data link-1
ATDS	airborne tactical data system
ATF	amphibious task force
ATO	air tasking order
ATRIMS	aviation training and readiness information management system
AWACS	airborne warning and control system
AWC	air warfare commander; assistant weapons controller
BDZ	base defense zone
BVR	beyond visual range
C^2	command and control
C^2W	command and control warfare
C^3	command, control, and communications
C^4I	command, control, communications, computers, and intelligence
CAC^2S	common aviation command and control system
CAP	combat air patrol
CAS	close air support
CATF	commander, amphibious task force
CBR	chemical, biological, and radiological
CEC	cooperative engagement capability
CEOI	communications-electronics operating instructions
CID	combat identification
CIU	communications interface unit
CLF	commander, landing force
CM	cruise missile
COA	course of action
COMSEC	communications security
COS	current operations section

CP	contact point
CRC	control and reporting center
CRE	control and reporting element
CRP	combat readiness percentage
CSSE	combat service support element
CTAPS	contingency theater automated planning system
CU	computer unit
DAS	deep air support (function); direct air support (communication net)
DASC	direct air support center
DAT	direct access trunk
DCU	digital communication unit
DDB	digital data bus
DLC	data link coordinator
DLR	data link relay
DLRP	data link reference point
DTS	data terminal set
EA	electronic attack
ECAC	Electromagnetic Compatibility Analysis Center
ECU	environmental control unit
EEI	essential elements of information
EID	electronic identification
ELINT	electronics intelligence
EMCON	emission control
EOB	enemy order of battle
EP	electronic protection
EPO	electronic protection operator
ES	electronic warfare support
EW	electronic warfare
EW/C	early warning and control
FAA	Federal Aviation Administration
FAC(A)	forward air controller (airborne)
FAD	fighter air direction
FDOC	fire direction operations center

FEBA	forward edge of the battle area
FEZ	fighter engagement zone
FFCC	force fires coordination center
FIR	frequency interference report
FLIR	forward-looking infrared radar
FLOT	forward line of own troops
FMF	fleet Marine force
FOB	forward operating base
FOC	future operational capability
FOS	future operations section
FRM	Firmware Reconfigurable Modem
FSCC	fire support coordination center
FTC	force track coordinator
FTX	field training exercise
GBAD	ground based air defense
GCE	ground combat element
GBDL	ground-based data link
GPS	global positioning system
GRU	gridlock reference unit
HARM	high-speed anti-radiation missile
HF	high frequency
HIDACZ	high-density airspace control zone
HMMWV	high mobility multi-purpose wheeled vehicle
Hz	hertz
ID	identification
IADS	integrated air defense system
ICAO	International Civil Aviation Organization
ICN	interface coordination net
ICO	interface coordination officer
ICU	interface control unit
IFF	identification, friend or foe
IFR	instrument flight rules
IGPS	improved global positioning system
IOC	initial operational capability

IR	infrared
IRCM	infrared countermeasures
IRE	internal radio equipment
ISO	International Standards Organization
JEZ	joint engagement zone
JFACC	joint force air component commander
JFC	joint force commander
JM	JTIDS module
JSTE	joint service training exercise
JTIDS	joint tactical information distribution system
JTF	joint task force
JTMD	joint theater missile defense
kw	kilowatt
LF	landing force
LMS	lightweight multi-purpose shelter
LOS	line of sight
LVS	logistics vehicle system
MACCS	Marine air command and control system
MACG	Marine air control group
MACS	Marine air control squadron
MADCP	modified air defense communications platform
MAG	Marine aircraft group
MAGTF	Marine air-ground task force
MAPP	Marine aviation planning problem
MATCD	Marine air traffic control detachments
MAWTS	Marine aviation weapons and tactics squadron
MC	missile controller
MCAEW	Marine Corps airborne early warning
MCO	Marine corps order
MCCRES	Marine Corps Combat Readiness Evaluation System
MCE	modular control equipment
MD	multi-destination
MDTC	Marine division tactics course
MEDEVAC	medical evacuation

MEF	Marine expeditionary force
MEF (Fwd)	Marine expeditionary force (forward)
MEP	mobile electric power
MEZ	missile engagement zone
MHE	materials handling equipment
MHz	megahertz
MIG	MCE interface group
MIJI	meaconing, intrusion, jamming, and interference
MINCOMM	minimum communication
MISTEX	MACCS integrated simulated training exercise
MMU	mass memory unit
MPS	mission performance standard
MRR	minimum risk route
MRU	military radar unit
MSV	multi-speed variant
MTS	*modern tracking system*
MUX	multi-channel radio
MWCS	Marine wing communications squadron
MWSS	Marine wing support squadron
NADGE	NATO air defense ground environment
NATO	North Atlantic Treaty Organization
NAVAID	navigation aid
NBC	nuclear, biological, and chemical
NCS	net control station
NDB	non-directional beacon
NEF	naval expeditionary force
NRT	near-real-time
NTDS	naval tactical data system
OAAW	offensive antiair warfare
OCU	operator console unit
OJT	on-the-job training
OPLAN	operation plan
PPDL	point to point data link
PPI	plan position indicator

PRU	printer unit
PU	participating unit
RADC	Regional Air Defense Commander
RADCON	radiation control
RAP	recognized air picture
RCC	Rescue Coordination Center
RF	radio frequency
RHI	range height indicator
RICO	Regional Interface Control Officer
RIU	radar interface unit
ROE	rules of engagement
RSTA	reconnaissance, surveillance, and target acquisition
RTF	return to force
RU	reporting unit
SAD	senior air director
SADC	Sector Air Defense Facility
SADF	Sector Air Defense Commander
SAM	surface-to-air missile
SAR	search and rescue
SAW	surface-to-air weapon
SCC	system configuration coordinator
SD	single destination
SID	surveillance identification director
SIF	selective identification feature
SIGSEC	signals security
SIMEX	simulated exercise
SJS	shelterized JTIDS system
SO	surveillance operator
SOA	states of alert
SOF	special operations forces
STD	senior traffic director
SWD	senior weapons director
SWO	senior watch officer
SYSCON	system control

T&R	training and readiness
TAC	tactical air command net
TAC(A)	tactical air coordinator (airborne)
TACAN	tactical air navigation system
TACC	tactical air command center (USMC); tactial air control center (USN)
TACP	tactical air control party
TAD	tactical air direction
TADC	tactical air direction center
TADCC	tactical air defense controller course
TADIL	tactical digital information link
TAMPS	tactical aviation mission planning system
TAOC	tactical air operations center
TAOM	tactical air operations module
TAR/HR	tactical air request/helicopter request
TATC	tactical air traffic controller (TAOC position); tactical air traffic control (communications net)
TAWO	tactical air watch officer
TBM	theater ballistic missile
TBMCS	Theater Battle Management Core Systems
T/E	table of equipment
TECHCON	technical control
TFMS	Theater Force Management System
TIBS	tactical intelligence broadcast system
TIG	TAOM interface group
T/O	table of organization
TM	theater missile
TMD	theater missile defense
TRAP	tactical recovery of aircraft and personnel
TRAP	tactical and related applications program
TSN	track supervision net
TTI	time-to-intercept
UAV	unmanned aerial vehicle
UHF	ultrahigh frequency
USCC	unit system coordinate center

v	volt
VCAU	voice control access unit
VFR	visual flight rules
VHF	very high frequency
VID	visual identification
VPN	voice product net
VOR	VHF omni-directional range system
WEZ	weapon engagement zone
WTI	weapons and tactics instructor

Section II
Definitions

A

active air defense - Direct defensive action taken to nullify or reduce the effectiveness of hostile air action. It includes such measures as the use of aircraft, air defense weapons, weapons not used primarily in an air defense role, and electronic warfare. (Joint Pub 1-02)

air defense - All defensive measures designed to destroy attacking enemy aircraft or missiles in the Earth's envelope of atmosphere, or to nulify or reduce the effectiveness of such attack. (Joint Pub 1-02)

airspace control authority - The commander designated to assume overall responsibility for the operation of the airspace control system in the airspace control area. (Joint Pub 1-02) Also called ACA.

area air defense commander - Within a unified command, subordinate unified command, or joint task force, the commander will assign overall responsibility for air defense to a single commander. Normally, this will be the component commander with the preponderance of air defense capability and the command, control, and communications capability to plan and execute integrated air defense operations. Representation from the other components involved will be provided, as appropriate, to the area air defense
commander's headquarters. (Joint Pub 1-02) Also called AADC.

area of operations - An operational area defined by the joint

force commander for land and naval forces. Areas of operation do not typically encompass the entire operational area of the joint force commander, but should be large enough for component commanders to accomplish their missions and protect their forces. (Joint Pub 1-02) Also called AO.

area of responsibility - 1. The geographical area associated with a combatant command within which a combatant commander has authority to plan and conduct operations. 2. In naval usage, a predefined area of enemy terrain for which supporting ships are responsible for covering by fire on known targets or targets of opportunity and by observation. (Joint Pub 1-02) Also called AOR.

B

base defense zone - An air defense zone established around an air base and limited to the engagement envelope of short-range air defense weapons systems defending that base. Base defense zones have specific entry, exit, and identification, friend or foe procedures established. (Joint Pub 1-02) Also called BDZ.

C

counter air - A US Air Force term for air operations conducted to attain and maintain a desired degree of air superiority by the destruction or neutralization of enemy forces. Both air offensive and air defensive actions are involved. The former range throughout enemy territory and are generally conducted at the initiative of the friendly forces. The latter are conducted near or over friendly territory and are generally reactive to the initiative of the enemy air forces. (Joint Pub 1-02)

D

data link - The means of connecting one location to another for the purpose of transmitting and receiving data. (Joint Pub 1-02)

deep air support - Air action against enemy targets at such a distance from friendly forces that detailed integration of each mission with fire and movement of friendly forces is not required. Deep air support missions are flown on either side of the fire support coordination line; the lack of a requirement for close coordination with the fire and movement of friendly forces is the qualifying factor. (FMFRP 0-14) Also called DAS.

direct air support - Air support flown in direct response to a specific request from the supported unit. (FMFRP 0-14)

direct air support center - The principal air control agency of the Marine air command and control system responsible for the direction and control of air operations directly supporting the ground combat element. It processes and coordinates requests for immediate air support and coordinates air missions requiring integration with ground forces and other supporting arms. It normally collocates with the senior fire support coordination center within the ground combat element and is subordinate to the tactical air command center. (FMFRP 0-14, proposed modification to Joint Pub 1-02) Also called DASC.

direct air support center (airborne) - An airborne aircraft equipped with the necessary operations and communications facilities, and manned by the essential personnel, to function in a limited role, as a DASC. (FMFRP 0-14, proposed modification to Joint Pub 1-02) Also called DASC(A).

E

electronic warfare - Any military action involving the use of electromagnetic and directed energy to control the electromagnetic spectrum or to attack the enemy. Also called EW. The three major subdivisions within EW are: electronic attack, electronic protection, and electronic warfare support.

a. electronic attack - That division of electronic warfare involving the use of electromagnetic or directed energy to attack personnel, facilities, or equipment with the intent of degrading, neutralizing, or destroying enemy combat capability. Also called EA. EA includes 1. actions taken to prevent or reduce an enemy's effective use of the electromagnetic spectrum, such as jamming and electromagnetic deception, and 2. employment of weapons that use either electromagnetic or directed energy as their primary destructive mechanism (lasers, RF weapons, particle beams).

b. electronic protection - That division of electronic warfare involving actions taken to protect personnel, facilities, and equipment from any effects of friendly or enemy employment of electronic warfare that degrade, neutralize, or destroy friendly combat capability. Also called EP.

c. electronic warfare support - That division of electronic warfare involving actions tasked by, or under direct control of, an operational commander to search for, intercept, identify, and locate sources of intentional and unintentional radiated electromagnetic energy for the purpose of immediate threat recognition. Thus, electronic warfare support provides information required for immediate decisions involving electronic warfare operations and other tactical actions such as threat avoidance, targeting, and homing. Also called ES. Electronic warfare support data can be used to produce signals intelligence

(SIGINT), communications intelligence (COMINT), and electronics intelligence (ELINT). (Joint Pub 1-02)

emission control - The selective and controlled use of electromagnetic, acoustic, or other emitters to optimize command and control capabilities while minimizing, for operations security (OPSEC): a. Detection by enemy sensors; b. Minimize mutual interference among friendly systems; and/or c. Execute a military deception plan. (Joint Pub 1-02) Also called EMCON.

essential elements of information - The critical items of information regarding the enemy and the environment needed by the commander by a particular time to relate with other available information and intelligence in order to assist in reaching a logical decision. (Joint Pub 1-02) Also called EEI.

F

forward operating base - An airfield used to support tactical operations without establishing full support facilities. The base may be used for an extended time period. Support by a main operating base will be required to provide backup support for a forward operating base. (FMFRP 0-14) Also called FOB.

future operations section - That portion of the tactical air command center and aviation combat element commander's battlestaff responsible for the detailed planning and coordination of all future air operations conducted by the aviation combat element in support of the Marine air-ground task force. The future operations section plans for and publishes the next air tasking order(s) (normally a 48 to 72-hour period). (FMFRP 0-14) Also called FOS.

G

gap filler radar - A radar used to supplement the coverage of the principal radar in areas where coverage is inadequate. (Joint Pub 1-02)

H

high-density airspace control zone - Airspace designated in an airspace control plan or airspace control order, in which there is a concentrated employment of numerous and varied weapons and airspace users. A high-density airspace control zone has defined dimensions, which usually coincide with geographical features or navigational aids. Access to a high-density airspace control zone is normally controlled by the maneuver commander. The maneuver
commander can also direct a more restrictive weapons status within the high-density airspace control zone. (Joint Pub 1-02) Also called HIDACZ.

I

identification - The process of determining the friendly or hostile character of an unknown detected contact. (Joint Pub 1-02)

J

joint force air component commander - The joint force air component commander derives authority from the joint force commander who has the authority to exercise operational control, assign missions, direct coordination among subordinate commanders, redirect and organize forces to ensure unity of effort in the accomplishment of the overall mission. The joint force commander will normally designate a joint force air component commander. The joint force air component

commander's responsibilities will be assigned by the joint force commander (normally these would include, but not be limited to, planning, coordination, allocation, and tasking based on the joint force commander's apportionment decision). Using the joint force commander's guidance and authority, and in coordination with other Service component commanders and other assigned or supporting commanders, the joint force air component commander will recommend to the joint force commander apportionment of air sorties to various missions or geographic areas. (Joint Pub 1-02) Also called JFACC.

joint theater missile defense - The integration of joint force capabilities to destroy enemy theater missiles in flight or prior to launch or to otherwise disrupt the enemy's theater missile operations through an appropriate mix of mutually supportive passive missile defense; active missile defense; attack operations; and supporting command, control, communications, computers, and intelligence measures. Enemy theater missiles are those that are aimed at targets outside the continental United States. (Joint Pub 1-02) Also called JTMD.

L

low-altitude missile engagement zone - In air defense, that airspace of defined dimensions within which the responsibility for engagement of air threats normally rests with low- to medium-altitude surface-to-air missiles. (Joint Pub 1-02) Also called LOMEZ.

low level transit route - A temporary corridor of defined dimensions established in the forward area to minimize the risk to friendly aircraft from friendly air defenses or surface forces. (Joint Pub 1-02) Also called LLTR.

M

Marine air command and control system - A US Marine Corps air command and control system which provides the aviation combat element commander with the means to command, coordinate, and control all air operations within an assigned sector and to coordinate air operations with other Services. It is composed of command and control agencies with communications-electronics equipment that incorporates a capability from manual through semiautomatic control. (FMFRP 0-14, proposed modification to Joint Pub 1-02)

Marine air-ground task force - A task organization of Marine forces (division, aircraft wing, and service support groups) under a single command and structured to accomplish a specific mission. The Marine air-ground task force components will normally include command, aviation combat, ground combat, and combat service support elements (including Navy Support Elements). Three types of Marine air-ground task forces which can be task organized are the Marine expeditionary unit, Marine expeditionary force (forward), and Marine expeditionary force. Also called MAGTF. The four elements of a MAGTF are:

a. command element (CE) - The MAGTF headquarters. The CE is a permanent organization composed of the commander, general or executive and special staff sections, headquarters section, and requisite communications and service support facilities. The CE provides command, control, and coordination essential for effective planning and execution of operations by the other three elements of the MAGTF. There is only one CE in a MAGTF.

b. aviation combat element (ACE) - The MAGTF element that is task organized to provide all or a portion

of the functions of Marine Corps aviation in varying degrees based on the tactical situation and the MAGTF mission and size. These functions are air reconnaissance, anti-air warfare, assault support, offensive air support, electronic warfare, and control of aircraft and missiles. The ACE is organized around an aviation headquarters and varies in size from a reinforced helicopter squadron to one or more Marine aircraft wing(s). It includes those aviation command (including air control agencies), combat, combat support, and combat service support units required by the situation. Normally, there is only one ACE in a MAGTF.

c. ground combat element (GCE) - The MAGTF element that is task organized to conduct ground operations. The GCE is constructed around an infantry unit and varies in size from a reinforced infantry battalion to one or more reinforced Marine division(s). The GCE also includes appropriate combat support and combat service support units. Normally, there is only one GCE in a MAGTF.

d. combat service support element (CSSE) - The MAGTF element that is task organized to provide the full range of combat service support necessary to accomplish the MAGTF mission. CSSE can provide supply, maintenance, transportation, deliberate engineer, health, postal, disbursing, enemy prisoner of war, automated information systems, exchange, utilities, legal, and graves registration services. The CSSE varies in size from a MEU service support group (MSSG) to a force service support group (FSSG). Normally, there is only one combat service support element in a MAGTF. (proposed change to Joint Pub 1-02) Note: A fourth type of MAGTF which can be task-organized is the special purpose force.

Marine air traffic control mobile team - A task organized element provided by the Marine air traffic control detachment to

perform control of friendly aircraft operating within the assigned base defense zone of a forward operating base air facility/air site. The mobile team provides visual flight rules (VFR) air traffic control services within its assigned terminal control area and base defense zone. Normally, a fully manned and equipped mobile team capability can be provided on a 24-hour basis for up to 72 hours without resupply or augmentation. (FMFM 5-50) Also called MMT.

Marine expeditionary brigade - A Marine air-ground task force that is constructed around a reinforced infantry regiment, a composite Marine aircraft group, and a brigade service support group. The Marine expeditionary brigade (MEB), commanded by a general officer, is task-organized to meet the requirements of a specific situation. It can function as part of a joint task force, or as the lead echelon of the Marine expeditionary force (MEF), or alone. It varies in size and composition, and is larger than a Marine expeditionary unit but smaller than a MEF. The MEB is capable of conducting missions across the full range of military operations. It may contain other Service or foreign military forces assigned or attached. Also called MEB.

Marine expeditionary force - The largest Marine air-ground task force and the Marine Corps principal warfighting organization, particularly for larger crises or contingencies. It is task-organized around a permanent command element and normally contains one or more Marine divisions, Marine aircraft wings, and Marine force service support groups. The Marine expeditionary force is capable of missions across the range of military operations, including amphibious assault and sustained operations ashore in any environment. It can operate from a sea base, a land base, or both. It may also contain other Service or

foreign military forces assigned or attached to the MAGTF. Also called MEF.
See also aviation combat element; combat service support element; command element; ground combat element; Marine air-ground task force; Marine expeditionary force (Forward); Marine expeditionary unit; special purpose Marine air-ground task force; task force.

Marine expeditionary unit - A Marine air-ground task force that is constructed around an infantry battalion reinforced, a helicopter squadron reinforced, and a task-organized combat service support element. It normally fulfills Marine Corps forward sea-based deployment requirements. The Marine expeditionary unit provides an immediate reaction capability for crisis response and is capable of limited combat operations. It may contain other Service or foreign military forces assigned or attached. Also called MEU.
See also aviation combat element; combat service support element; command element; ground combat element; Marine air-ground task force; Marine expeditionary force; Marine expeditionary force (Forward); Marine expeditionary unit (special operations capable); special purpose Marine air-ground task force; task force.

minimum-risk route - A temporary corridor of defined dimensions recommended for use by high-speed, fixed-wing aircraft that presents the minimum known hazards to low-flying aircraft transiting the combat zone. (Joint Pub 1-02) Also called MRR.

missile engagement zone - The airspace of defined dimensions within which the responsibility for engagement normally rests with missiles. (FMFM 5-60) Also called MEZ. MEZs may be designated within the missile intercept zone (MIZ).

mutual support - That support which units render each other

against an enemy, because of their assigned tasks, their position relative to each other and to the enemy, and their inherent capabilities. (Joint Pub 1-02)

N

naval tactical data system - A complex of data inputs, user consoles, converters, adapters, and radio terminals interconnected with high-speed, general-purpose computers and its stored programs. Combat data is collected, processed, and composed into a picture of the overall tactical situation, which enables the force commander to make rapid, accurate evaluations and decisions. (Joint Pub 1-02) Also called NTDS.

near real time - Pertaining to the timeliness of data or information which has been delayed by the time required for electronic communication and automatic data processing. This implies that there are no significant delays. (Joint Pub 1-02)

O

offensive air support - Those air operations conducted against enemy installations, facilities, and personnel to directly assist the attainment of MAGTF objectives by the destruction of enemy resources or the isolation of his military force. (FMFRP 0-14) Also called OAS.

offensive anti-air warfare - Those operations conducted against enemy air assets and air defense systems before they can be launched or assume an attacking role. Offensive anti-air warfare operations in or near the objective area consist mainly of air attacks to destroy or neutralize hostile aircraft, airfields, radars, air defense systems, and supporting areas. (FMFRP 0-14) Also called OAAW.

operations security - A process of identifying critical information and subsequently analyzing friendly actions attendant to military operations and other activities to:

a. Identify those actions that can be observed by adversary intelligence systems.

b. Determine indicators hostile intelligence systems might obtain that could be interpreted or pieced together to derive critical information in time to be useful to adversaries.

c. Select and execute measures that eliminate or reduce to an acceptable level the vulnerabilities of friendly actions to adversary exploitation. (Joint Pub 1-02) Also called OPSEC.

P

passive air defense - All measures, other than active air defense, taken to minimize the effectiveness of hostile air action. These measures include deception, dispersion, and the use of protective construction.
(Joint Pub 1-02)

R

rules of engagement - Directive issued by competent military authority which delineate the circumstances and limitations under which United States forces will initiate and/or continue combat engagement with other forces encountered. (Joint Pub 1-02) Also called ROE.

S

sector air defense commander - An individual designated by the aviation combat element commander to function as his air defense battle manager. He functions to the extent of authority delegated to him by the aviation combat element commander. The sector anti-air warfare coordinator is responsible for coordination and management of all active air defense weapons (aircraft and surface-to-air weapons) within his assigned sector. (FMFRP 0-14) Also called SADC.

T

tactical air operations center - The principal air control agency of the Marine air command and control system responsible for airspace control and management. It provides real time surveillance, direction, positive control, and navigational assistance for friendly aircraft. It performs real time direction and control of all anti-air warfare operations, to include manned interceptors and surface-to-air weapons. It is subordinate to the tactical air command center. (FMFRP 0-14, proposed modification to Joint Pub 1-02) Also called TAOC.

theater missile - A missile, which may be a ballistic missile, a cruise missile, or an air-to-surface missile (not including short-range, non-nuclear, direct fire missiles, bombs, or rockets such as Maverick or wire-guided missiles), whose target is within a given theater of operation. (Joint
Pub 1-02)

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Appendix D

References and Related Publications

Joint Publications (Joint Pubs)

0-2	Unified Action Armed Forces (UNAAF)
1-02	Department of Defense Dictionary of Military and Associated Terms
3-0	Doctrine for Joint Operations
3-01	Joint Doctrine for Countering Air and Missile Threats
3-01.5	Doctrine for Joint Theater Missile Defense
3-50.2	Doctrine for Joint Combat Search and Rescue
3-52	Doctrine for Joint Airspace Control in a Combat Zone
3-56.1	Command and Control for Joint Air Operations

Naval Warfare Publications (NWPs)

3-01.01	Anti-air Warfare
3-01.10	Anti-air Warfare Commander's Manual
3-01.8	JIADS (Joint Integrated Air Defense Systems), ALSA/NWP
3-56.1	JFACC Organization And Processes
3-56.2	TAGS (Theater Air Ground System), ALSA/NWP
6-02.1	Brevity Codes, ALSA/NWP
6-02.5	TADIL-J/LINK-16, ALSA/NWP

Marine Corps Doctrinal Publications (MCDPs)

1	Warfighting

Marine Corps Warfighting Publications (MCWPs)

3-2	Aviation Operations
3-25	Control of Aircraft and Missiles
3-25.1	ICAC 2, ALSA/FMFRP
3-25.2	TAGS, ALSA
3-25.3	MACCS Handbook
3-25.4	TACC Handbook
3-25.5	DASC Handbook
3-25.6	SAAWC Handbook
3-25.8	MATCD Handbook
3-25.9	MACCS Comm Handbook
3-25.10	LAAD Handbook
5-11.1	Aviation Planning, FMFM 5-70

Marine Corps Reference Publications (MCRP)

5-12C Marine Corps Supplement to the DOD Dictionary of Military and Associated Terms

Marine Corps Orders (MCOs)

P3500.19 Training and Readiness (T&E) Manual
3501.9B Marine Corps Combat Readiness Evaluation System (MCCRES)

Appendix E

Recommendations for Equipment Deadlining Criteria

AN/TYQ-23(V)4 TAOM

(1) The TAOM will be considered deadlined if it is unable to perform either of its two basic functions. These two functions are: (1) to receive, process, correlate, display, and forward sensor and/or data link track information and (2) to transmit, receive, and process voice communication information.

(2) A failure of any component or secondary repairable in any redundant system which degrades the operational capability of a particular equipment group or unit by 50 percent or more. Equipment groups that fall into this category are as follows:

a. Operator Console Units
b. Computer Units
c. Computer Unit Bus Interface Controllers
d. Communications Interface Unit
e. Digital Data Bus
f. Voice Communications Bus
g. Radar Data Bus

(3) A failure of any component or secondary repairable in any non-redundant system that renders a particular equipment group or unit completely inoperative. Equipment groups that fall into this category are as follows:

a. Communications Interface Unit Bus Interface Controller
b. Radar Interface Unit
c. Mass Memory Unit
d. Power Distribution Control Unit
e. Disk Memory Unit
f. Digital Communications Unit Controller
g. Digital Communications Unit Modem
h. Mass Memory Controller
i. Exchange Assembly

JTIDS MODULE

The JM will be considered deadlined if it is unable to perform its primary mission of transmitting and receiving JTIDS information in a JTIDS network.

(1) A failure of any component secondary repairable or software that inhibits the JM's ability to transmit and receive JTIDS information is justification to consider the JM deadlined.

ADCP

The ADCP will be considered deadlined if it is unable to perform its primary mission of transmitting TBM data over both JTIDS and GBDL.

(1) A failure of any componet, secondary repairable, or software that inhibits the ADCP's ability to transmit data over a JTIDS network or GBDL is justification to consider the ADCP deadlined.

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AN/TPS-59(V)3 RADAR

(1) The radar will be considered deadlined if it is unable to perform either of its two basic missions. These two missions are (1) detecting and tracking ABTs (Air Breathing Targets) and (2) detecting and tracking TBMs (Theater Ballistic Missiles).

(2) A failure of any component, secondary repairable, or software that inhibits the radar's ability to detect and track ABTs and/or TBMs is justification to consider the radar deadlined.

(3) A failure of any component, secondary repairable, or software that inhibits the radar's ability to detect, receive, process, and display IFF targets is justification to consider the radar deadlined.

(4) A failure of any component, secondary repairable, or software that inhibits the radar's ability to detect, receive, process, display, and accurately classify Mode 4 IFF targets is justification to consider the radar deadlined.

(5) A failure of any component, secondary repairable, or software that inhibits the radar's ability to forward Radar, IFF, or Mode 4 information via the TOAM Interface Group (TIG) to the TAOM is justification to consider the radar deadlined.

(6) A failure of any component, secondary repairable, or software that inhibits the radar's ability to forward TBM information (via PPDL) to the air defense communications platform (ADCP) is justification to consider the radar deadlined.

(7) The antenna array electronics must be maintained at a high level of performance in order for the radar to accurately detect and track targets. The level of performance required for TBMs is much greater than for ABTs. Therefore, the deadline criteria for the array electronics will be based on the

minimum required performance level for TBM detection. The following guidance is given: The radar will be considered deadlined when 6 or more rows of electronics are down (faulty). A row will be considered down if any of the following components have failed:

a) Row Power Supply
b) Row Transmitter
c) Row Receiver
d) Row Feed
e) Any combination that yields a total of ***Six Rows Down***. [Example: 1 Row Power Supply (Rows 3 & 4) + 2 Row Transmitters (Rows 51 & 54) + 2 Row Receivers (Rows 11 & 20) yields a total of 6 Rows down.]

NOTE: In the above example it is possible to move the failed components so that only two rows are down. The bad Transmitters in Rows 51 & 54 and the bad Receivers in Rows 11 & 20 can be moved to Rows 3 and 4 with the bad Power Supply. The Radar OIC will make every effort to reduce the number of failed rows before deadlining the radar.

AN/TPS-63 RADAR

(1) The radar will be considered deadlined if it is unable to perform its basic mission of detecting and tracking ABTs (Air Breathing Targets).

(2) A failure of any component or secondary repairable that inhibits the radar's ability to detect and track ABTs is justification to consider the radar deadlined.

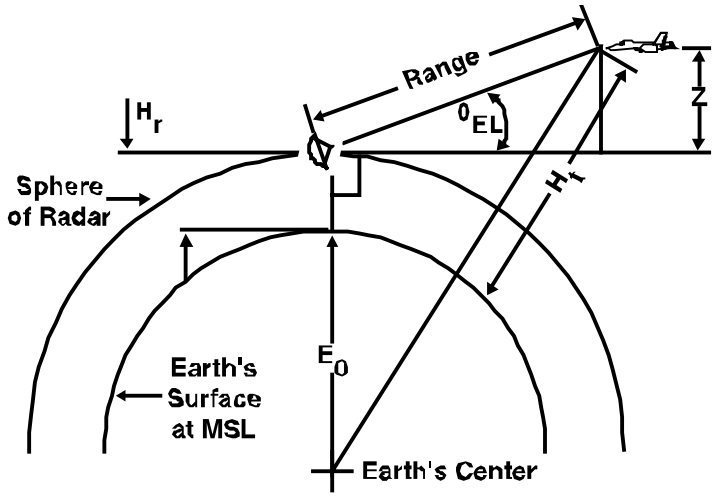
(3) A failure of any component or secondary repairable that inhibits the radar's ability to detect, receive, process, and display IFF targets is justification to consider the radar deadlined.

(4) A failure of any component or secondary repairable that inhibits the radar's ability to detect, receive, process, display, and accurately classify Mode 4 IFF targets is justification to consider the radar deadlined.

(5) A failure of any component, secondary repairable, or software that inhibits the radar's ability to forward Radar, IFF, or Mode 4 information via the TOAM Interface Group (TIG) to the TAOM is justification to consider the radar deadlined.

Appendix F

RADAR HEIGHT FINDING



(E 0 +H t) 2 = (E 0 +H r) 2 + R 2 - 2 (E 0 +H r) R* Cos *(0 EL +90°)

E 0 = the earth's radius

H t = the height of the target above mean sea level (MSL)

H r = the elevation of the radar above MSL

R = the range (slant range) from radar to target

0 EL = the radar's elevation angle (degrees)

The above formula determines altitude and range limitations of a radar system tracking a target in relation to the earth's curvature.

Figure 2-4. Radar height finding geometry.